Determinants of Infant Mortality in CLMV Countries

ဒီသုတေသနက **CLMV နိုင်ငံများ (ကမ္ဘောဒီးယား၊ လာအို၊ မြန်မာ၊ ဗီယက်နမ်)** မှာ **ကလေးသေနှုန်း (Infant Mortality Rate - IMR)** ကို သက်ရောက်မှုရှိတဲ့ အကြောင်းရင်းများကို လေ့လာထားတာဖြစ်ပါတယ်။

၁။ သုတေသနဒီဇိုင်း (Research Design)

- **Quantitative Research** နည်းလမ်းကို အခြေခံပါတယ်။
- **Time Series Data** ကို သုံးထားပါတယ်။ ဆိုလိုတာက ၁၉၉၉ ခုနှစ်ကနေ ၂၀၁၆ ခုနှစ်အထိ (၁၈ နှစ်) ကာလအတွင်း နှစ်အလိုက် မှတ်တမ်းတင်ထားသော ဒေတာများကို စုဆောင်းလေ့လာခြင်း ဖြစ်ပါတယ်။

၂။ ဒေတာ အမျိုးအစားနှင့် အရင်းအမြစ် (Data Type and Source)

- **ဒုတိယအဆင့် ဒေတာ (Secondary Data)** ကိုသာ အသုံးပြုထားပါတယ်။
- အဓိက ဒေတာအရင်းအမြစ်မှာ **World Bank (ကမ္ဘာ့ဘဏ်)** ရဲ့ World Bank Open Data ဖြစ်ပါတယ်။
- ဒေတာများကို CLMV နိုင်ငံတစ်ခုချင်းစီအတွက် သီးသန့် စုဆောင်းခွဲခြမ်းစိတ်ဖြာထားပါတယ်။

၃။ ခွဲခြမ်းစိတ်ဖြာမှု နည်းလမ်းများ (Data Analysis Methods)

သုတေသနမှာ နည်းလမ်း (၂) မျိုး ပေါင်းစပ်အသုံးပြုထားပါတယ်။

(က) ဖော်ပြချက် စာရင်းအင်းနည်းလမ်း (Descriptive Statistics)

- **အဓိပ္ပာယ်:** လေ့လာထားသော အချက်အလက်များ (ကလေးသေနှုန်း၊ အမျိုးသမီးပညာရေး၊ သံဓာတ်အားနည်းရောဂါ စသည်) ၏ အခြေအနေကို ဇယားများ (Tables) နှင့် ဂရပ်များ (Graphs) ဖြင့် ရှင်းလင်းပြသခြင်း ဖြစ်ပါတယ်။
- **သုံးသည့်နေရာ:** စာတမ်း၏ **အခန်း (၃)** တွင် ရွေးချယ်ထားသော ကိန်းရှင်များ၏ ၁၈ နှစ်အတွင်း ပြောင်းလဲတိုးတက်မှုအခြေအနေကို ပြသရန် အသုံးပြုထားပါတယ်။

(ခ) ကိန်းဂဏန်း ခန့်မှန်းခြင်း နည်းလမ်း (Inferential Statistics)

- **အဓိပ္ပာယ်:** ကိန်းရှင်များကြား ဆက်သွယ်မှုကို စမ်းသပ်ဖော်ထုတ်ရန် ဖြစ်ပါတယ်။
- **Multiple Regression Analysis**
    - ဒီနည်းလမ်းက ကလေးသေနှုန်း (IMR) ကို သက်ရောက်မှုရှိသည့် အကြောင်းရင်းများ (ဥပမာ- ပညာရေး၊ ကျန်းမာရေး) ၏ ဆက်စပ်မှုကို သိရှိနိုင်ပါတယ်။
    - နိုင်ငံတစ်ခုချင်းစီအတွက် သီးသန့် မော်ဒယ်တစ်ခုစီ တည်ဆောက်ခွဲခြမ်းထားပါတယ်။

မော်ဒယ် တည်ဆောက်ပုံ (Model Specification)

သုတေသနမှာ အသုံးပြုထားသော မော်ဒယ်ညီမျှခြင်းမှာ -

IMR = β_0 + β_1(အမျိုးသမီး ပျမ်းမျှသက်တမ်း) + β_2(အမျိုးသမီး အလယ်တန်းပညာ ပြီးဆုံးမှုနှုန်း) + β_3(အမျိုးသမီး မိသားစုလုပ်ငန်းတွင် အလုပ်လုပ်သူနှုန်း) + β_4(ကိုယ်ဝန်ဆောင်အမျိုးသမီးများတွင် သံဓာတ်အားနည်းရောဂါ ဖြစ်ပွားနှုန်း)

- **IMR** = ကလေးအသေသေနှုန်း (အမှီသဟဲ ကိန်းရှင်)
- **β_0** = စဉ်ဆက်မပြတ် ကိန်းသေ (Intercept)
- **β_1, β_2, β_3, β_4** = လေ့လာလိုသော အကြောင်းရင်းများ၏ သက်ရောက်မှု ပမာဏ (Regression Coefficients)

၄။ ခွဲခြမ်းစိတ်ဖြာမှု မစမီ စစ်ဆေးခဲ့သည့် ယူဆချက်များ (Diagnostic Tests)

Multiple Regression Analysis သည် ယူဆချက်အချို့ကို လိုက်နာရန် လိုအပ်ပါတယ်။ ဒါမှသာ ရလဒ်များ ယုံကြည်စိတ်ချရမှာဖြစ်ပါတယ်။ ဒီစာတမ်းမှာ အောက်ပါစစ်ဆေးမှုတွေကို နိုင်ငံတစ်ခုချင်းစီအတွက် အသေအချာ လုပ်ဆောင်ထားပါတယ်။

- **ပုံမှန်ဖြန့်ကျက်မှု စစ်ဆေးခြင်း (Test of Normality):** ဒေတာများသည် ပုံမှန်ဖြန့်ကျက်မှုရှိမရှိ **Kolmogorov-Smirnov** နှင့် **Shapiro-Wilk** စစ်ဆေးမှုများဖြင့် စစ်ဆေးထားပါတယ်။

- **Multicollinearity Check:** လေ့လာထားသော အကြောင်းရင်းများ (ဥပမာ- ပညာရေးနှင့် သက်တမ်း) ကြားတွင် အလွန်အမင်း ဆက်စပ်နေခြင်း ရှိ/မရှိကို **Variance Inflation Factor (VIF)** ဖြင့် စစ်ဆေးထားပါတယ်။ VIF တန်ဖိုး ၁၀ ထက်များနေပါက ပြဿနာရှိသည်ဟု သတ်မှတ်ပြီး၊ ဆက်စပ်မှုမြင့်မားသော ကိန်းရှင်ကို မော်ဒယ်မှ ဖယ်ထုတ်ကာ ပြန်လည်တည်ဆောက်ထားပါတယ်။

- **အမှားများ၏ ကိုယ်ပိုင်ဆက်စပ်မှု စစ်ဆေးခြင်း (Autocorrelation Check):** Time-Series Dataတွင် ရှိလေ့ရှိသော ပြဿနာဖြစ်သည့် ကာလအလိုက် အမှားများ ဆက်စပ်နေခြင်း ရှိ/မရှိကို **Durbin-Watson Test** ဖြင့် စစ်ဆေးထားပါတယ်။ တန်ဖိုး ၂.၀ အနားတွင် ရှိပါက ဆက်စပ်မှုမရှိဟု ယူဆပါတယ်။

- **အမှားများ၏ ညီညာမှု စစ်ဆေးခြင်း (Heteroscedasticity Check):** ခန့်မှန်းမှုအမှားများသည် ညီညာစွာ ဖြန့်ကျက်နေခြင်း ရှိ/မရှိကို **White's General Test** ဖြင့် စစ်ဆေးထားပါတယ်။

၅။ ဆော့ဖ်ဝဲလ်နှင့် ခွဲခြမ်းစိတ်ဖြာမှု

- ဒေတာများကို ခွဲခြမ်းစိတ်ဖြာရန် **SPSS** သို့မဟုတ် **R** ကဲ့သို့သော စာရင်းအင်းဆော့ဖ်ဝဲလ်တစ်ခုခုကို အသုံးပြုထားကြောင်း သိရပါတယ်။

📊 **အနှစ်ချုပ်**

ဒီသုတေသနရဲ့နည်းလမ်းစဉ်ကို အတိုချုပ်ပြောရရင် -

"CLMV နိုင်ငံများအတွက် World Bank မှ ၁၉၉၉-၂၀၁၆ ကာလအတွင်း ရရှိသော secondary data များကို ယူပြီး၊ ဖော်ပြချက်စာရင်းအင်းများဖြင့် အခြေအနေကို ကြည့်ကာ၊ Multiple Regression Analysis ဖြင့် ကလေးသေနှုန်းအပေါ် သက်ရောက်မှုရှိသော အကြောင်းရင်းများကို ရှာဖွေခြင်း" ဖြစ်ပါတယ်။

နည်းလမ်းစဉ်သည် စနစ်တကျရေးဆွဲထားပြီး၊ ရလဒ်များ ယုံကြည်စိတ်ချရစေရန် လိုအပ်သော စစ်ဆေးမှုများကိုပါ လုပ်ဆောင်ထားသောကြောင့် ခိုင်မာတဲ့ သုတေသနတစ်ခုဖြစ်ကြောင်း သိရပါတယ်။

YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

MASTER OF APPLIED STATISTICS PROGRAMME

DETERMINANTS OF INFANT MORTALITY IN CLMV COUNTRIES

KHIN THANDAR SOE

MAS - 17

MARCH 2020

YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF STATISTICS

DETERMINANTS OF INFANT MORTALITY IN CLMV COUNTRIES

This thesis is submitted to the Board of Examination as partial fulfillment of the requirements for the Degree of Master of Applied Statistics

Approved by the Board of Examiners

Supervised by

Dr. Aye Thida
Professor
Department of Statistics
Yangon University of Economics

Submitted by

Ma Khin Thandar Soe
Roll No.17
MAS (Batch -1)
Yangon University of Economics

ACCEPTANCE

Accepted by the Board of Examiners of the Department of Statistics, Yangon University of Economics in partial fulfillment for the requirement of the Master Degree, Master of Applied Statistics.

.....…….

(Chairperson)

Prof. Dr Tin Win

Rector

Yangon University of Economics

……

(Supervisor)

Dr. Aye Thida

Professor

Department of Statistics

Yangon University of Economics

…….

(Chief Examiner)

Prof. Dr. Maw Maw Khin

Professor/Head

Department of Statistics

Yangon University of Economics

……

(Examiner)

Daw Win Win Nu

Associate Professor (Retired)

Department of Economics

Yangon University of Distance Education

…….

(Examiner)

Prof. Dr. Mya Thandar

Professor

Department of Statistics

Yangon University of Economics

ABSTRACT

Health is one of the main elements in order to socially develop a society. Providing quality and affordable healthcare is one of the most important challenges facing many nations. Developing the health services accelerate socio-economic development. Development is not only about the rate of per capita income, but also includes basis social indicators such as life expectancy, labor force, education and health indicators. That's why this study investigates the relationship between socio-economic indicators and Infant Mortality Rate (IMR) over the period 1999 - 2016 for Cambodia, Lao, Myanmar and Vietnam (CLMV) countries by using Multiple Regression Model. Despite numerous independent variables are considered in the study, the evidence reveals that IMR has a negative relation with Female Secondary School Completion Rate and explained for all CLMV countries. It is statistically significant at 1% level for the all countries except Cambodia. IMR has a positive relation with Female Contributing Family Workers and explained for Myanmar with the significant level at 1%. Similarly, IMR has a positive relation with Prevalence Rate of Pregnancy Anemia and explained for Cambodia, Lao PDR and Vietnam. It is also statistically significant at 1% level.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my appreciation to the Master of Applied Statistics Programme for providing me with the opportunity to undertake the study. I owe my gratitude to Professor Dr. Tin Win, Rector of Yangon University of Economics, Professor Dr. Ni Lar Myint Htoo, Pro-rector of Yangon University of Economics, for supporting and offering the MAS programme which significantly contributed to my academic improvement and enhancement of professional knowledge.

I would like to express my sincere thanks to Professor Dr. Maw Maw Khin, Head of the Department of Statistics and Programme Director of the Master of Applied Statistics for her guidance on my academic achievement and professional growth.

I would like to convey my special thanks to Professor Dr. Mya Thandar, the Department of Statistics, Yangon University of Economics, for her valuable suggestions, advices and recommendations to improve my thesis. I want to acknowledge Associate Professor Daw Win Win Nu (Retd.), the Department of Economics, Yangon University of Distance Education for her helpful comments and guidance.

I would like to show my heartfelt appreciation to my supervisor, Professor Dr. Aye Thida, the Department of Statistics, Yangon University of Economics for her encouragement, invaluable guidance and supervision throughout this thesis.

I also want to express my sincere thanks to all Professors, Associate Professors and Lecturers for imparting a great variety of knowledge and concept of Statistics as well as to all my friends for their kindness and supports during the study in MAS programme. Finally, I would like to express my appreciation to the World Bank for public data sharing.

CONTENTS

			Page
ABSTRACT			**i**
ACKNOWLEDGEMENTS			**ii**
CONTENTS			**iii**
LIST OF TABLES			**vi**
LIST OF FIGURES			**vii**
LIST OF ABBREVIATIONS			**viii**
CHAPTER I	**INTRODUCTION**		
	1.1	Rationale of the Study	1
	1.2	Objectives of the Study	2
	1.3	Method of Study	3
	1.4	Scope and Limitations of the Study	3
	1.5	Organization of the Study	3
CHAPTER II	**LITERATURE REVIEWS**		
	2.1	Millennium Development Goals and Sustainable Development Goals	4
	2.2	Global Overview of Infant Mortality	5
	2.3	Reviews on Previous Studies	5
CHAPTER III	**SITUATION OF INFANT MORTALITY IN CLMV COUNTRIES**		
	3.1	Infant Mortality CLMV Countries	10
	3.2	Descriptive Statistics of the Selected Indicators	13
		3.2.1 Infant Mortality Rate (IMR)	13
		3.2.2 Life Expectancy at Birth, Female (LEx)	15
		3.2.3 Lower Secondary Completion Rate, Female (SC)	16
		3.2.4 Contributing Family Workers Rate, Female (FW)	18
		3.2.5 Prevalence of Anemia among Pregnant Women, (PRE_ANE)	19
CHAPTER IV	**MULTIPLE REGRESSION ANALYSIS OF INFANT MORTALITY**		
	4.1	Multiple Regression Analysis	22
	4.2	Results for Cambodia	25
		4.2.1 Test of Normality, Infant Mortality Rate for Cambodia	25

4.2.2 Checking for Multicollinearity and Autocorrelation for Cambodia 26
4.2.3 Remedy of Multicollinearity for IMR of Cambodia 27
4.2.4 Checking for Heteroscedasticity for Cambodia 28
4.2.5 The Residual Normality Test for Cambodia 29
4.2.6 The Estimation Results for Cambodia 29
4.3 Results for Lao PDR 30
4.3.1 Test of Normality for Lao PDR 30
4.3.2 Checking for Multicollinearity and Autocorrelation for Lao PDR 30
4.3.3 Remedy of Multicollinearity for IMR of Lao PDR 32
4.3.4 Checking for Heteroscedasticity for Lao PDR 33
4.3.5 The Residual Normality Test for Lao PDR 34
4.3.6 The Estimation Results for Lao PDR 34
4.4 Results for Myanmar 35
4.4.1 Test of Normality for Myanmar 35
4.4.2 Checking for Multicollinearity and Autocorrelation for Myanmar 35
4.4.3 Remedy for Multicollinearity for IMR of Myanmar 36
4.4.4 Checking for Heteroscedasticity for IMR of Myanmar 38
4.4.5 The Residual Normality Test for Myanmar 38
4.4.6 The Estimation Results for Myanmar 38
4.5 Results for Vietnam 39
4.5.1 Test of Normality for Vietnam 39
4.5.2 Checking for Multicollinearity and Autocorrelation for Vietnam 39
4.5.3 Remedy for Multicollinearity for IMR of Vietnam 40
4.5.4 Checking for Heteroscedasticity for IMR of Vietnam 42
4.5.5 Checking for the The Residual Normality Test for Vietnam 42
4.5.6 The Estimation Results for Vietnam 42

CHAPTER V CONCLUSION

5.1 Findings 43

5.2 Recommendations 46

5.3 Further Study 46

REFERENCES

APPENDICES

LIST OF TABLES

Table No.	Title	Page
3.1	Infant Mortality Rate (1999-2016)	13
3.2	Female Life Expectancy in CLMV Countries (1999-2016)	15
3.3	Female Lower Secondary Completion Rate (%) (1999-2016)	17
3.4	Female Contributing Family Workers, (% of female employment) (1999-2016)	18
3.5	Prevalence of Anemia among Pegnant Women (%)	20
4.1	Tests of Normality (IMR) for Cambodia	25
4.2	Results of Multiple Regression Model for Cambodia	26
4.4	Correlation Matrix for Cambodia	27
4.4	Results of Multiple Regression Model for IMR of Cambodia	27
4.5	White's General Heteroscedasticity Test Results for Cambodia	28
4.6	Tests of Normality (IMR) for Lao PDR	30
4.7	Results of Multiple Regression Model for Lao PDR	31
4.8	Correlation Matrix for Lao PDR	32
4.9	Results of Multiple Regression Model for Lao PDR	32
4.10	White's General Heteroscedasticity Test Results for Lao PDR	33
4.11	Tests of Normality (IMR) for Myanmar	35
4.12	Results of Multiple Regression Model for Myanmar	35
4.13	Correlation Matrix for Myanmar	36
4.14	Results of Multiple Regression Model for Myanmar	37
4.15	White's General Heteroscedasticity Test Results for Myanmar	38
4.16	Tests of Normality (IMR) for Vietnam	39
4.17	Results of Multiple Regression Model for Vietnam	39
4.18	Correlation Matrix for Vietnam	40
4.19	Results of Multiple Regression Model for Vietnam	41
4.20	White's General Heteroscedasticity Test Results for Vietnam	42

LIST OF FIGURES

Figure No.	Title	Page
3.1	Infant Mortality Rate (1999-2016)	14
3.2	Female Life Expectancy in CLMV Countries (1999-2016)	16
3.3	Female Lower Secondary Completion Rate (1999-2016)	17
3.4	Female Contributing Family Workers, (% of female employment) (1999-2016)	19
3.5	Prevalence of Anemia among Pregnant Women (%) (1999-2016)	24

LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
CDHS	Cambodia Demographic and Health Survey
CLMV	Cambodia, Laos, Myanmar and Vietnam
CMR	Child Mortality Rate
DHS	Demographic and Health surveys
EENC	Early Essential Newborn Care
HSSP-2	Health Sector Support Program-Second Phase
IMCI	integrated management of childhood illness
IMR	Infant Mortality Rate
JICA	Japan International Cooperation Agency
MDG	Millennium Development Goals
OECD	Economic Co-operation and Development Countries
SDG	Sustainable Development Goals
U5MR	Under 5 Mortality Rate
UHC	Universal health Coverage
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Health status of the nation is one of the important factors that represent the success of development of a country. Infant Mortality Rate (IMR) is a main concern for many developing countries where there is limited access to health care and suitable living conditions. The IMR is not only seen as the measure of the risk of infant death, but it is also used broadly as a main indicator of community health and socioeconomic status within a community, to measure availability of health services and quality of medical technology. The health and well-being of children and families all over the world are compared by IMR. The global calculations of the annual infant mortality rate are widely used for comparisons across regions, populations and time periods. These comparisons of IMR are frequently used as baseline indicators in assessments and to evaluate the impact of public health programs.

There are numerous reasons to cause infant mortality, including inadequate sanitation, inadequate water quality, malnourishment of the mother and infant, insufficient prenatal and medical care, and using infant formula to substitute a breastfeeding. Maternal status and disparities of wealth are also impacted in infant mortality rates. A country where women have few rights and there is a large income difference between the poor and the wealth, tend to be high the IMR. The lower level of education and limited access to birth control can lead to increase numbers of births per mother and the intervals between births are low. That is also a major challenge that create less recovery period for mothers and imply potential food shortages in poor families. It was found that when women are educated, they are more likely to give birth at later marriage ages and to seek better health care and better education for their children.

In 2000 the United Nations (UN) developed eight international development goals following the millennium summit and each goal was to be achieved by the year 2015. Goal four was to reduce CMR and IMR by two-thirds. Since the summit, the

worldwide number of children under five deaths declined from 12.6 million in 1990 to 5.8 million in 2015 including the number of infant deaths reduced from 8.8 million in 1990 to 4.3 million in 2015 and the number of neonatal deaths turned down from 5.0 million in 1990 to 2.7 million in 2015 (WHO Global, 2018 September 12).

However, increasing proportion of child deaths are in Southern Asia and sub-Saharan Africa. The UN found that as overall Child Mortality Rate (CMR) declines, the proportion of deaths that occur during the first month after birth is increasing. Children born in poor countries are almost double as likely to dead before their age of five years as those from wealthier, and children with educated mothers have better chance to survive than children of mothers with no education.

On the average, the ASEAN Member States have achieved a large reduction in child mortality and could meet the target of the Millennium Development Goals. The target was quite ambitious in its effort to not just reduce the rate by half, but by two-third. The average of under-five mortality rate in ASEAN Member States was 82 out of 1000 children born alive in 1990 and had decreased to 25 in 2015. The ASEAN-6 countries had already reached a comparatively low level of under-five mortality rate in 1990 and continued to reduce the rate to reach the target of a two-third reduction.

The mortality rate was high in Cambodia, Lao PDR, Myanmar and Vietnam (CLMV) countries in 1990, but they have managed to reduce the rate significantly over the 25 years. The target of a 2/3 reduction is also applied on the IMR. In this regard, it would require the IMR to be reduced from 57 deaths of 1,000 live births in 1990 to 19 deaths in 2015. Although ASEAN-6 group missed the target of two-third reduction in IMR, the CLMV countries did slightly better. CLMV countries managed to reduce the rate to 32% to reach the target of a 2/3 reduction in IMR over these 25 years. Hence, IMR is a main concern for many developing countries where there is limited access to health care and suitable living conditions, this study intends to explore the determinants of Infant Mortality in CLMV countries.

1.2 Objectives of the Study

The objectives of the study are _

(i) to study the situations of Infant Mortality in CLMV countries

(ii) to explore the determinants of Infant Mortality in CLMV countries.

1.3 Method of Study

In this study, the descriptive statistics was used to explain the situations of Infant Mortality. The multiple-regression analysis was also done to explore the determinants of Infant Mortality in this study.

1.4 Scope and Limitations of the Study

This study examined the determinants of Infant Mortality over the period covering from the Year 1999 to 2016. Secondary data from World Bank's socio-economic indicators and health indicators that represents for CLMV countries were used for the analysis.

1.5 Organization of the Study

This study was organized into five chapters which are as follows. Chapter I is introduction encompassing the rationale, objective, method, scope and limitations, and organization of the study. Chapter II is literature reviews that will give the overviews on the child mortality and determinants of infant mortality explored in other studies. Chapter III provides the descriptive statistics of the infant mortality and explanatory variables. Chapter IV presents the statistical analysis on multiple regression of the infant mortality in CLMV country. Chapter V explains the findings and conclusion of the study.

CHAPTER II
LITERATURE REVIEWS

There are a plenty of literatures available regarding on the socioeconomic factors associated with Infant Mortality for developed countries, developing countries, and the United States specifically.

Although Infant Mortality Rate is most commonly used dependent variable in many studies for regression analysis, empirical specification and data utilized are different in many ways. Some studies model infant mortality in the context of a "health" production function, whereby a series of independent variables are considered as determinants of infant mortality.

2.1 Millennium Development Goals and Sustainable Development Goals

Millennium Development Goals (MDG) 4 was only targeted to reduce the under-five mortality rate by two-thirds in the period between 1990 and 2015. Some of the achievements of MDG 4 found as follows; a decrease in worldwide rate of mortality in children under-five by over 50 percent, reducing from 90 infant deaths in 1990 to 43 deaths in 2015 per 1,000 live births. Similarly, it dropped the number of children under-five deaths from 12.7 million in 1990 to nearly 6 million in 2015, despite the population growth in developing regions., the annual rate of under-five mortality reduction was more than five times between 2005 - 2013 compared to between 1990 - 1995 in sub-Saharan Africa. The measles vaccination prevented about 15.6 million deaths between 2000 - 2013 which means 67 percent decline in the number of cases of measles reported globally. Nearly 84 percent of children across the globe received at least one dose of measles containing vaccine in 2013 before that 73 percent increase since 2000. More than 33 percent of all deaths in children under five dues to undernutrition. Thus, it is necessary to improve food security at household level and nutrition have increased the chances of children growing to adulthood. The Sustainable Development Goal target for child mortality is intended to be end, by 2030.

2.2 Global Overview of Infant Mortality

There was a world remarkable progress in child survival in the past few decades, and millions of children have better chances to survive than in 1990. One in 26 children died before reaching their age 5 years in 2017, compared to 1 in 11 children in 1990. The progress in reducing child mortality has also been quickened in the 2000–2017 period compared with the 1990s, with the annual rate of reduction in the global under-five mortality rate increasing from 1.9 percent in 1990–2000 to 4.0 per cent in 2000–2017. Although the global progress recorded in reducing child mortality over the past few decades, an estimated 5.4 million children under age 5 died in 2017—roughly 50% of those deaths occurred in sub-Saharan Africa.

In 2017, 4.1 million (75% of all under-five deaths) occurred before first year of their live. The risk of a child dying under one year was highest in the WHO African Region (51 per 1000 live births), over six times higher than that in the WHO European Region (8 per 1000 live births). Globally, the IMR has decline from 65 in 1990 to 29 per 1000 live births in 2017. Annual infant deaths have reduced more than 50% from 8.8 million in 1990 to 4.1 million in 2017.

There is huge variation in child mortality rates between developed and developing countries. It was found that 6 deaths and 54 deaths per 1000 live births, in industrialized and developing countries respectively. Neonatal deaths in Southern-Asia account the highest in the world. Moreover, disparities of child survival exist among different regions and countries. For instance, 1 child in 13 under-five children dies in sub-Saharan regions while the ratio is 1 under-five child in 189 in the world's high-income countries. The global burden of child deaths is a call for urgent and concerted action to further improve the survival chances of the world's children.

2.3 Reviews on Previous Studies

In 1980, Bauman and Anderson linked between the decline of infant mortality rates and the legalization of abortion. The concentration of the analysis at the U.S. state level data between the years 1967 and 1973 (note, abortion was legalized in 1973). It examined the annual rate of change in the abortion to live birth ratio during study period. It is found that only the years between 1967 and 1969 showed a statistically significant relationship between the abortion-birth ratio and the infant mortality rate, which was also time when few legal abortions were performed.

Grossman and Jacobowitz (1981) found that there is no relationship between abortion rates and infant mortality in their study using U.S. state-level data. The reasons for this contrast, according to Grossman and Jacobowitz, is that Bauman and Anderson do not consider other variables that affect infant mortality. Also, the infant mortality was not subdivided by race.

The different determinants of infant and early childhood mortality (decline) were important and they acted on different causes of death. Therefore, these should be studied separately. In international comparison, the results showed with respect to determinants of mortality for one country do not necessarily apply to other countries. (Judith H Wolleswinkel-van den Bosch,a Frans WA van Poppel,b Caspar WN Loomana and Johan P Mackenbacha, 2000)

Daniel Kim and Adrianna Saada, 2013found that the important health outcome, infant mortality is unequally distributed across countries at a global level. Among Organization for Economic Co-operation and Development (OECD) countries, infant deaths per 1,000 live births ranged from 1.8 in Luxembourg to 15.2 in Mexico in 2008. In the 20th century, the major reductions in aggregate infant mortality rates (IMR) is the United States (USA) IMR ranks poorly compared to other high-income economies with 6.7 deaths per 1,000 live births in 2008.

It is also found that the general pattern of mortality in Italy was typical of a very backward country while the expectancy at birth was low, infant and child mortality rates were very high and infectious and parasitic diseases were prevalent. (Breschi M., Derosas R., 2000).

An infant ran a high health risk if he were either consigned in a wet nurse or given cow’s milk under unsanitary conditions. The death rate of upper-class infants whose mothers chose not to nurse them approached that of working-class infants whose mothers could not nurse them. Varying infant feeding practices were sufficiently important to have given the most economically disadvantaged groups relatively favorable levels of infant mortality rates (Tilly, 1973).

According to OSAWE, Osayanmon Wellington, 2014, the determinants of infant mortality results came from 53 African countries showed that fertility rate significantly affect infant mortality rate in a positive way. Similarly, it showed that GDP per capita, public health expenditure, Prevalence of HIV and the participation of adult female in the labor force significantly affect infant mortality rate. Moreover,

fertility rate and GDP per capita had the most impact on infant mortality rate respectively.

It is also learnt that Anyanwu and Erhijakpor (2009) explored the impact of healthcare spending on health outcomes in Africa. Utilizing infant and under-age-five mortality rates were used as dependent variables, the regressors included healthcare expenditure, ethnic fractionalization, female literacy, number of physicians, and income per capita with a semi-log specification.

In 1991, Eberstadt found that low birth weight is a leading indicator of infant mortality. According to the determinants of low birth weight was explored and found low birth weight is more likely to occur among African Americans and other minority racial groups.

John Ross Costa (2009) found that Higher levels of education and income were shown to lower infant mortality rates. The increment of total fertility rates and the consumption of alcohol and cigarette were shown to raise infant mortality rates. Having the right political policies were also found to lower infant mortality, although this relationship is not entirely clear.

The importance of identifying mothers'age at first birth as an influential factor in isolation to the other socio-economic and demographic factors in Zimbabwe is as the result of findings in previous studies in Sub-Saharan Africa. These studies have largely established that mothers, who are young, particularly those who are 18 years of age and less at first birth, are more likely to experience to be at the risk of maternal outcomes in comparison to mothers' bear children between the ages of 20 and 35 (Rutstein, 2000).

There were also studies conducted to identify factors associated with trends in infant and child mortality in developing countries. Rutstein (2000) focused on the notion that while IMR and CMR in the 1990's declined in most countries, IMR increased in some developing nations. The study explored several groups of factors associated with IMR and CMR consist of fertility behavior, nutritional status of children and patterns of infant feeding, maternal and child health status, use of health services, environmental health factors, and socioeconomic factors (Rutstein, 2000). The two most significant factors identified by Rutstein, that are responsible for declines in IMR and CMR are better living conditions (access to better food and clean water, also more sanitation) and access to health care (women receiving prenatal care and births assisted by professionals).

IMR in developing countries was also analyzed in a study by Gordon (2009) analyzed IMR and CMR in Haiti. The study argues that infant mortality is the most sensitive indicator of a child's health and serves as a measure of the effectiveness of public sector policy in addressing the needs of a nation's poor and disadvantaged. There are many factors that impact IMR and CMR; mainly poverty, which usually results in young mothers living in unsanitary conditions and location, which can result in healthcare facilities being far away and inaccessible without transportation.

In many developing countries, studies on under-five mortalities were conducted with different methodologies. Depending on the age when child dies, there is considerable variation in factors. Socio-demographic factors are key determinants for infant mortality while socio-economic, demographic and environmental are principally associated with child and under-five mortalities and studies were done on these factors. (Cornelius, Masanja, & Klipstein-Grobusch, 2013)

Faith Conroy (2015) has learnt that the determinants of IMR do vary between developed and developing countries. It was mentioned that GDP per capita, population density, expected years of education for females, and incidence of Tuberculosis per 100,000 in developing countries were determined to be significant determinants of IMR. Meanwhile, GDP per capita, health expenditures per capita, and incidence of Tuberculosis per 100,000 were statistically significant indicators in developed countries. The common findings in the literature is that economic indicators (GDP per capita and health expenditures per capita) are determinants of IMR. It is interesting that the population density and unemployment rate for both the developed and developing countries panel models were negative when they were expected to be positive.

The survival rate of under-five children can explain how healthy the health care system is. Myanmar is a country which consistently endeavoring to attain its health objectives Universal Health Coverage (UHC) by 2030. The results showed that mothers did not use contraceptive methods and preceding birth interval are significant determinants of infant, child and under-five mortalities. On the other hand, children who are breastfed have lower risk of death by 11.6 percent in infancy period and 12.4 percent in below under five aged in comparison with children who are not. The twin child, short birth interval, father who worked in manual workers and mothers with no using contraceptives, birth order, size of baby after delivery, skilled birth attendant, caesarean born child, mothers who did not work outside were found to be significant

predictors of infant mortality. Children from hilly, dry and delta ecological zone had a higher risk of under-five mortality in Myanmar. (Lal Hrin Mawi1, 2018)

Min Ko Ko et.al (2017) did an ecological analysis of community-level socioeconomic factors of infant and under-five mortality by using of 2014 censuses data, explanatory variables such as access to electricity, safe drinking water, safe latrine, maternal education, and maternal employment were used for infant and under-five mortality and the environmental factors and access to electricity are statistically significant by using of path analysis and recommended to analysis socio-economic factors of individual and household level for further study. (Ko Ko M, 2017)

CHAPTER III
SITUATION OF INFANT MORTALITY IN CLMV COUNTRIES

This chapter presents about the situation of infant mortality in CLMV countries and the selected indicators from 1999 to 2016 which are taken from the World Bank open data source.

3.1 Infant Mortality CLMV Countries

The development divides the ASEAN's newer members of Cambodia, the Lao People's Democratic Republic, Myanmar, and Vietnam; the CLMV countries from the organization's original members. There was a very large variation in the under-five mortality rate across ASEAN countries, from 8 to 181 of 1,000 live births in 1990. While the rates have in fact, been reduced over the years, the variation is still very high, from 3 to 86 deaths out of 1,000 live births before they reached their fifth birthday in 2015.

When consider the country level data, two different phenomena can be observed. The countries with high under-five mortality rates in 1990 have all reduced in 2015. However, among the countries with low rates in 1990, Malaysia and Singapore have managed to continue to lower the rates to less than half, while others such as Thailand and Brunei Darussalam have been progressing on a relatively slower pace. The target of a 2/3 reduction is also applied on the infant mortality rate. In this regard, it would require the infant mortality rate to be reduced from 57 deaths of 1,000 live births in 1990 to 19 deaths in 2015. The figures show that the infant mortality rate has been reduced to less than half in the ASEAN-6 group, but that they missed the target of 2/3 reduction. The CLMV countries did slightly better. They managed to reduce the rate to 32% and hence managed to reach the target of a 2/3 reduction in their infant mortality rate over these 25 years. The CLMV group started out with a substantially higher rate than the ASEAN-6 countries but has managed to reduce the gap over these 25 years especially with large reductions in every five-year period until 2010 before stabilizing towards 2015.

The rate of Infant Mortality are still high in Cambodia. Thus, the ministry wanted to reduce the Infant Mortality rate from 30 infants per 1,000 live births in 2010 to 14 infants by the end of 2020 (50 percent drop). Therefore, infant mortality remains worrisome as the Ministry of Health battles to reduce it by 2020.

According to the 2010 Cambodia Demographic and Health Survey (CDHS), both childhood and maternal mortality have decreased in recent years. The under-five mortality rate has dropped from 124 to 54 between 2000 and 2010. This means that about one in 20 children dies before their age of 5 year in Cambodia. Increasing the rate of vaccination and improving nutritional status would contribute to reductions in childhood mortality. 79% of children are fully vaccinated compared to only 67% in 2005 in Cambodia. When stunting and underweight, measures of malnutrition have decreased since 2000, the anemia prevalence rate of children has also declined. It is still 40% of children under 5 years in Cambodia are stunted, or too short for their age. This is a sign of chronic malnutrition. In addition, more than half of children (55%) age 6-59 months have anemia.

According to the 2010 CDHS, 89% of mother with a live birth received antenatal care from a skilled provider, and 71% of births were assisted by a skilled provider. More than one-third of married women are using a modern method of family planning compared to 27% in 2005. That's why the total fertility rate in Cambodia has dropped from 3.4 births per woman reported in 2005 to 3.0 births per woman reported in 2010. The knowledge of new mothers also remains challenge to improving health and wellbeing of infants and children. It is an issue children's education and their earning potential, for the rest of lives.

Lao PDR initiate to improved political participation by women because of the important role to improve and sustain government commitment to women's and children's health. In addition, nationally there was a commitment to improving gender equality and improved rights for women – strategies that are also believed to improve demand and support for health more generally. The reduction of mortality was associated both with improved coverage of effective interventions to prevent or treat the most important causes of child mortality, not only in essential immunizations, malaria prevention and treatment, vitamin A supplementation, birth spacing, early and exclusive breastfeeding but also for improvements in socioeconomic conditions. The decline rate of newborn mortality has been considerably slower than that of under 5 mortality. In 2012, under 5 mortality was represented 38%. Mortality reduction are

much slower among the poor, less educated and rural populations. The equity gap remains challenge.

According to the 2014 Census in Myanmar, Infant and Child Mortality was high when compared to other countries in the ASEAN region. The probability of dying among males is almost one third higher than that of females. Male Infant Mortality rates are universally higher than female rates. However, child mortality sex differentials tend to disappear or even reverse in most countries. Despite of a low level of fertility in Myanmar, there is still needed to improve infant and child mortality through a decline in fertility. Studies have shown the important decline in infant mortality would be achieved if women gave birth to fewer children as the fertility rate is directly related to early-age mortality. The other differentials suggest that substantial reductions of under-five mortality could be achieved by improving the standard of living of the population.

Infant mortality in Myanmar is more than two times higher than that observed in Southeast Asia, and almost two times higher than that in the developing countries. There still need for improvement, not only through programmes for disease control and access to health services, but also by reducing poverty and improving the living standards of vast sectors of the population. The 2013 Human Development Index (HDI) ranked Myanmar 150 out of 187 countries with an index value of 0.524. This index varies from 0.337 (Niger) to 0.944 (Norway). The value for East Asia and the Pacific is 0.707 (UNDP, 2014). It is unlikely that mortality in Myanmar, and in particular under-five mortality, can be significantly reduced unless socioeconomic development experiences a substantial and sustained advance.

Despite Vietnam has achieved to reduce child mortality in recent years, some children still die at early age. Only a few studies have been conducted to identify at-risk groups to provide baseline information for effective interventions. One of the studies showed that those living in rural areas had lower odds of experiencing a child death. There are also possible reasons why women living in rural areas were less likely to experience a child death compared with women in urban areas. It is also found that the positive association between maternal education and child death, which also differs from the results of previous studies. Globally, the infant mortality rate has decreased from an estimated rate of 65 deaths per 1000 live births in 1990 to 29 deaths per 1000 live births in 2017.

3.2 Descriptive Statistics of the Selected Indicators

Female Life Expectancy at Births, Female (LEx), Secondary School Completion Rate, Female (SC), Contributing Family Workers Rate, Female (FW) and Prevalence of Anemia among Pregnant Women, (PRE_ANE) were selected to explore the Infant Mortality Rate (IMR) in CLMV countries.

3.2.1 Infant Mortality Rate (IMR)

Infant mortality rate is defined as the number of infants dying before reaching one year of age, per 1,000 live births in a given year. Infant mortality rate for world and CLMV from 1999 to 2016 are shown in Table (3.1) and Figure (3.1).

Table (3.1) Infant Mortality Rate (1999-2016)

Year	Cambodia	Lao PDR	Myanmar	Vietnam	World
1999	83.5	78.9	66.6	24.5	54.8
2000	79.5	76.2	65.0	23.5	53.2
2001	73.8	73.6	63.5	22.7	51.5
2002	67.6	71.0	62.0	21.8	49.8
2003	62.0	68.4	60.4	21.1	48.0
2004	57.3	65.9	58.8	20.5	46.3
2005	53.2	63.3	57.1	20.0	44.6
2006	49.8	60.8	55.5	19.6	43.0
2007	46.6	58.4	53.8	19.2	41.4
2008	43.5	56.1	56.3	18.9	39.9
2009	40.5	53.8	50.3	18.7	38.4
2010	37.7	51.7	48.5	18.5	37.1
2011	35.0	49.5	46.8	18.2	35.7
2012	32.6	47.5	45.1	18.0	34.5
2013	30.5	45.6	43.5	17.8	33.4
2014	28.9	43.7	42.0	17.6	32.4
2015	27.5	42.0	40.6	17.4	31.4
2016	26.2	40.4	39.3	17.2	30.6

Source: World Bank Data, 2019

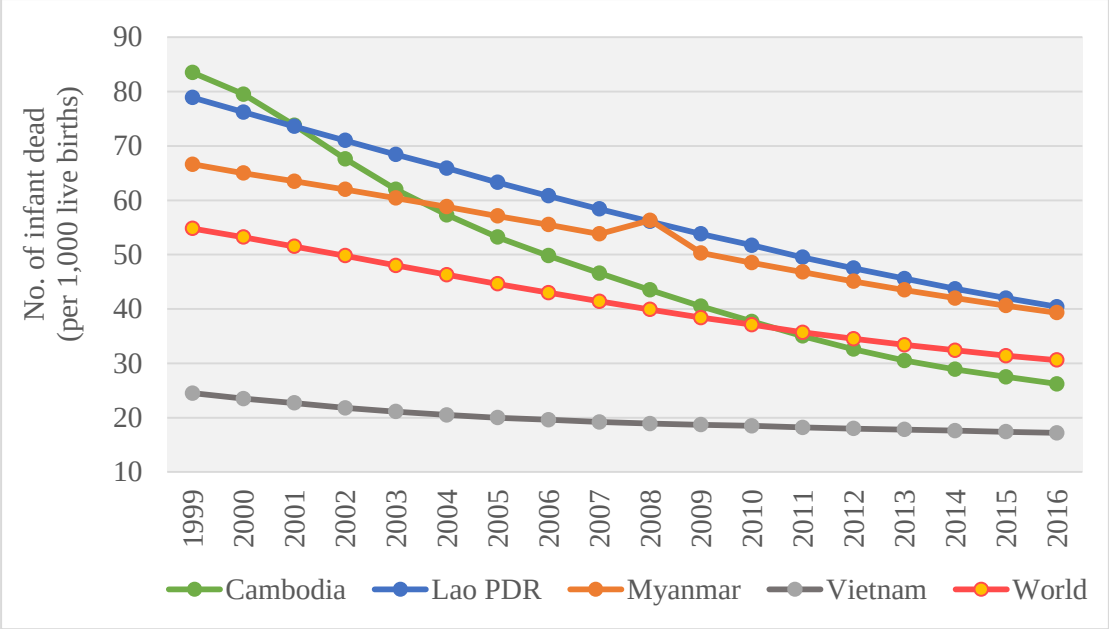


Figure (3.1) Trend of Infant Mortality Rate (1999-2016)

Source: Table (3.1)

Among the ASEAN member countries, the IMR of CLMV countries is higher than the other country within ASEAN. The IMR of Vietnam, 25 infant dead in 1999 reduced to 17 infant dead per 1000 live births in 2016. However, the significantly high infant mortality rate is found in Lao PDR, with 79 infant dead in 1999, 63 infant dead in 2005, 51 infant dead in 2010 and reduce to 40 infant dead in 2016. In Cambodia, it dramatically decreased after 2005. The IMR in Cambodia was 84 dead per 1000 live births in 2000, 53 dead in 2005, 38 dead in 2010 and it reached to 26 infant dead in 2016. In Myanmar, although it is decreasing from 67 infant dead in 1999 to 39 infant dead in 2016, it is significantly increased in 2008, because of the impact of the Nargis Cyclone affected in Ayeyarwady and Yangon region.

The global infant mortality rate in 1999 is 55 children under one year per 1000 live births and steadily decrease to reach under 40 children in 2008 until reaching to 31 children in 2016. This shows almost 45 percent of the infant dead declined in 17 years. At the global average rate of Infant Mortality shows 41.4 between 1999 and 2016, whereas the maximum number indicates 55 and the minimum is 31. Similarly, the average no. for Cambodia, Lao, Myanmar and Vietnam are 49, 58, 53 and 20 respectively.

The risk of a child dying before completing the first year of age was highest in the WHO African Region (51 infants per 1000 live births), which was over six times higher than that in the WHO European Region (8 infants per 1000 live births).

3.2.2 Life Expectancy at Birth, Female (LEx)

Life Expectancy at Birth means that the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. It also reflects the overall mortality level of a population. It could be summarized the mortality pattern that prevails across all age groups in a given year – children and adolescents, adults and the elderly. Table (3.2) and Figure (3.2) show the Life expectancy in CLMV countries from year 1999 to 2016.

Table (3.2) Life Expectancy in CLMV Countries (1999 – 2016)

Year	Cambodia	Lao PDR	Myanmar	Vietnam	World
1999	59.81	60.03	62.82	77.53	69.63
2000	60.62	60.62	63.11	77.71	69.87
2001	61.53	61.20	63.41	77.88	70.11
2002	62.48	61.77	63.73	78.03	70.34
2003	63.44	62.34	64.06	78.18	70.57
2004	64.40	62.91	64.41	78.31	70.89
2005	65.31	63.47	64.79	78.43	71.16
2006	66.15	64.02	65.19	78.53	71.51
2007	66.90	64.56	65.61	78.63	71.84
2008	67.57	65.10	66.04	78.72	72.16
2009	68.15	65.61	66.49	78.81	72.52
2010	68.64	66.12	66.93	78.88	72.84
2011	69.07	66.60	67.37	78.96	73.19
2012	69.47	67.06	67.80	79.03	73.48
2013	69.85	67.51	68.22	79.09	73.78
2014	70.23	67.93	68.61	79.16	74.07
2015	70.61	68.33	68.97	79.23	74.27
2016	70.98	68.71	69.30	79.29	74.51

Source: World Bank Data, 2019

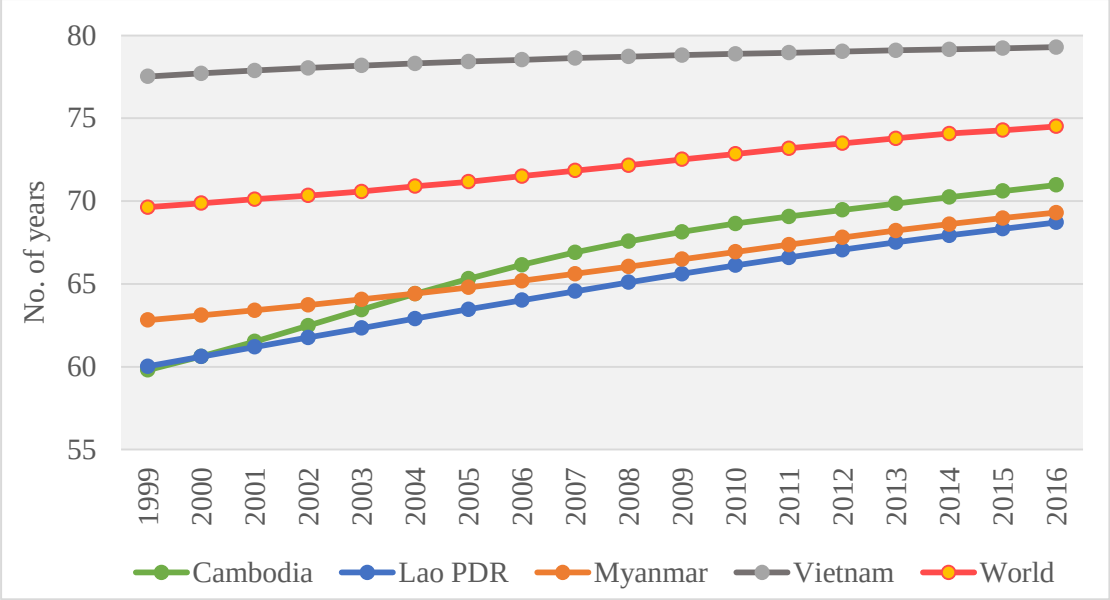


Figure (3.2) Life Expectancy in CLMV countries (1999 – 2016)

Source: Table (3.2)

About 11 years increased within 18 years in Cambodia whereas 8 years increased in Lao DPR, 6 years increased in Myanmar and 2 years increased in Vietnam respectively. Globally, the life expectancy at birth showed 72.0 years in 2016 (74.5 years for female and 70 years for male). According to global average, women live longer than men. The gap in life expectancy between women and men was 4.5 years in 1999 and had remained almost the same by 2016.

The life expectancy increased by 4.9 years globally between 1999 and 2016 that the fastest increase since the 1960s. The increase in 1999-2016 was greatest in the WHO African Region, where it increased by 10.3 years to 61.2 years, mainly by improvements in child survival, and expanded access to antiretrovirals for treatment of HIV.

3.2.3 Lower Secondary Completion Rate, Female (SC)

Lower Secondary Completion Rate is the measurement of the gross intake ratio to the last grade of lower secondary education. It is considered based on the calculation of the ratio of new entrants divided by the population at the entrance age for the last grade of lower secondary education.

Table (3.3) and Figure (3.3) show the school completion rate lower secondary children of the CLMV countries for 18 years.

Table (3.3) Lower Secondary Completion Rate (%) (1999-2016)

Year	Cambodia	Lao PDR	Myanmar	Vietnam	World
1999	32.00	27.32	29.99	65.16	59.14
2000	35.60	29.58	33.32	66.16	60.61
2001	30.00	31.02	32.24	65.22	62.18
2002	37.80	34.59	32.78	71.50	64.25
2003	31.58	36.69	36.28	72.00	66.00
2004	35.00	39.37	36.92	71.55	67.45
2005	45.00	39.26	38.57	73.05	68.08
2006	31.92	38.04	41.52	71.25	68.79
2007	35.99	38.31	40.91	72.30	69.82
2008	42.04	40.02	40.91	80.00	71.04
2009	44.40	42.51	43.68	81.00	71.98
2010	47.90	37.74	44.87	75.50	72.88
2011	45.43	39.90	44.87	79.90	73.00
2012	44.09	43.22	44.87	82.20	74.43
2013	43.56	46.76	44.87	79.27	74.55
2014	45.64	52.99	50.51	93.13	75.10
2015	48.98	59.72	50.51	95.19	76.13
2016	48.65	64.11	57.49	100.00	77.00

Source: World Bank Data, 2019

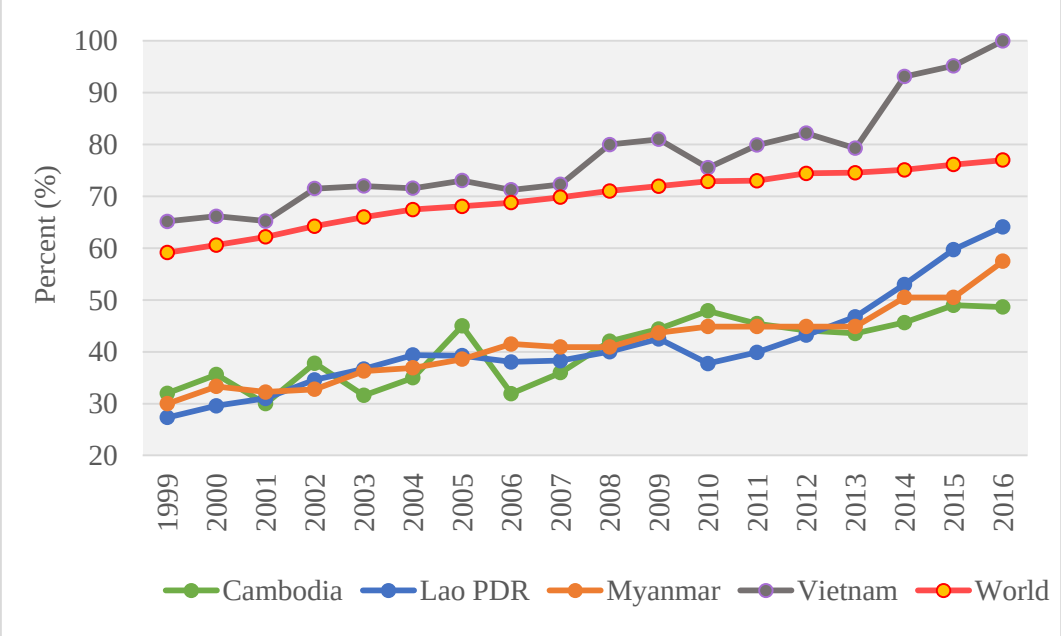


Figure (3.3) Female Lower Secondary Completion Rate (1999-2016)

Source: Table (3.3)

The school completion rate is significantly high in Vietnam compared with other CLMV countries, started from 65% in 1999, 100% in 2016. In other CLMV countries, Cambodia shows 32% in 1999 and 49% in 2016, Lao PDR increase from 27% in 1999 to 64% in 2016, and Myanmar presents 30% in 1999 and 57% in 2016 each.

3.2.4 Contributing Family Workers Rate, Female (FW)

Contributing Family Workers are those workers who hold "self-employment jobs" as own-account workers in a market-oriented establishment operated by a related person living in the same household. Table (3.4) and Figure (3.4) show the ratio of the adolescents out of their school from (1999-2016).

Table (3.4) Contributing Family Workers (%) (1999 – 2016)

Year	Cambodia	Lao PDR	Myanmar	Vietnam	World
1999	58.70	40.48	25.26	55.04	26.85
2000	59.14	41.01	25.24	54.11	26.45
2001	56.76	41.55	25.14	54.01	26.08
2002	54.62	41.99	24.96	53.30	25.71
2003	52.26	42.45	24.68	50.93	25.59
2004	49.83	42.78	24.34	47.40	25.14
2005	46.88	43.22	23.87	41.99	24.67
2006	44.02	42.78	23.32	36.67	23.84
2007	40.99	42.14	22.70	31.50	23.13
2008	37.97	42.46	22.18	26.68	22.49
2009	35.16	42.77	21.45	22.26	21.91
2010	32.17	43.15	20.73	26.27	21.56
2011	29.42	42.46	20.21	24.89	21.14
2012	26.80	40.89	19.53	23.16	20.64
2013	26.53	39.23	18.80	22.64	20.15
2014	26.27	38.36	18.12	26.59	19.76
2015	25.99	38.02	17.47	23.31	19.19
2016	25.64	37.89	26.35	22.08	18.73

Source: World Bank Data, 2019

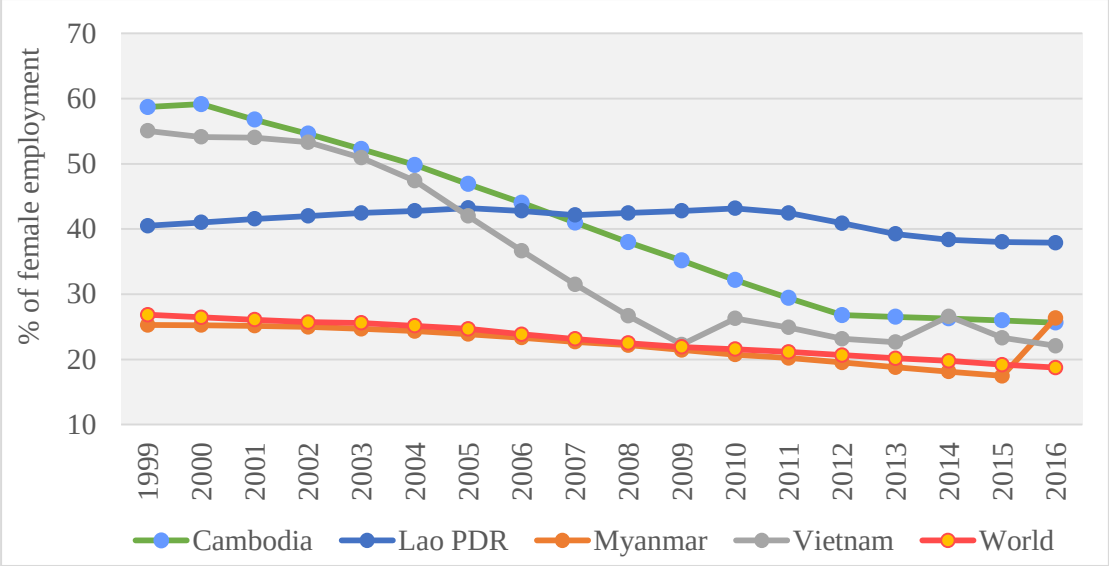


Figure (3.4) Female Contributing Family Workers (1999 – 2016)

Source: Table (3.4)

In Cambodia, it is decreasing from 59% in 1999 to 26% in 2016. Similarly, in Lao it is going ups and downs from 38% and 43% between 1999 and 2016. The figures for Myanmar are steadily decreasing from 25% in 1999 until 17% in 2015 but it suddenly reached to 26% in 2016. The ratios in Vietnam are decreasing from 55% to 22% within 18 years.

Own-account workers and contributing family workers are less likely to have formal work arrangements and are therefore more likely to lack decent working conditions, adequate social security and 'voice' through effective representation by trade unions and similar organizations. In terms of employment status, wage and salary employment is growing in Asia, the share of contributing family workers has been declined especially in CLMV countries.

3.2.5 Prevalence of Anemia among Pregnant Women, (PRE_ANE)

Prevalence of Pregnant Women's Anemia is the percentage of women whose hemoglobin level is less than 110 grams per liter at sea level during pregnancy. It is one of the most common nutritional deficiency disorders in the developing countries. Anemia during pregnancy is usually related with poor pregnancy outcome and it can cause in complications for both mother and fetus. A high prevalence of anemia in pregnant women apparently increases the risk to both maternal and fetal. It is recommended to improve the primary health care to be strengthened the prevention

and early diagnosis and to prioritize treatment of anemia in pregnancy. While the prevalence in developed countries is 14%, in developing countries is 51%.

Table (3.5) and Figure (3.5) show prevalence of anemia among the pregnant women in CLMV countries from 1999 to 2016.

Table (3.5) Prevalence of Anemia among Pregnant Women (%) (1999-2016)

Year	Cambodia	Lao PDR	Myanmar	Vietnam	World
1999	55.3	44.2	45.2	29.1	32.1
2000	58.4	43.0	44.4	27.9	31.6
2001	55.2	41.9	43.6	26.7	31.3
2002	53.6	43.0	43.0	25.8	29.0
2003	52.2	40.1	42.4	25.0	30.9
2004	51.1	39.3	41.9	23.0	30.7
2005	52.3	38.5	42.0	23.4	30.6
2006	49.6	37.7	41.0	22.7	30.4
2007	48.1	34.0	40.7	22.0	30.2
2008	47.3	36.5	40.4	21.3	30.0
2009	48.0	36.1	40.3	20.9	29.9
2010	46.2	36.0	42.0	20.6	29.0
2011	44.6	36.1	41.0	22.0	30.0
2012	45.2	36.5	41.7	21.0	30.3
2013	46.1	37.1	42.6	21.5	30.7
2014	41.8	36.5	43.6	22.2	31.3
2015	42.3	38.7	44.9	23.1	32.0
2016	44.8	39.7	46.3	24.2	32.8

Source: World Bank Data, 2019

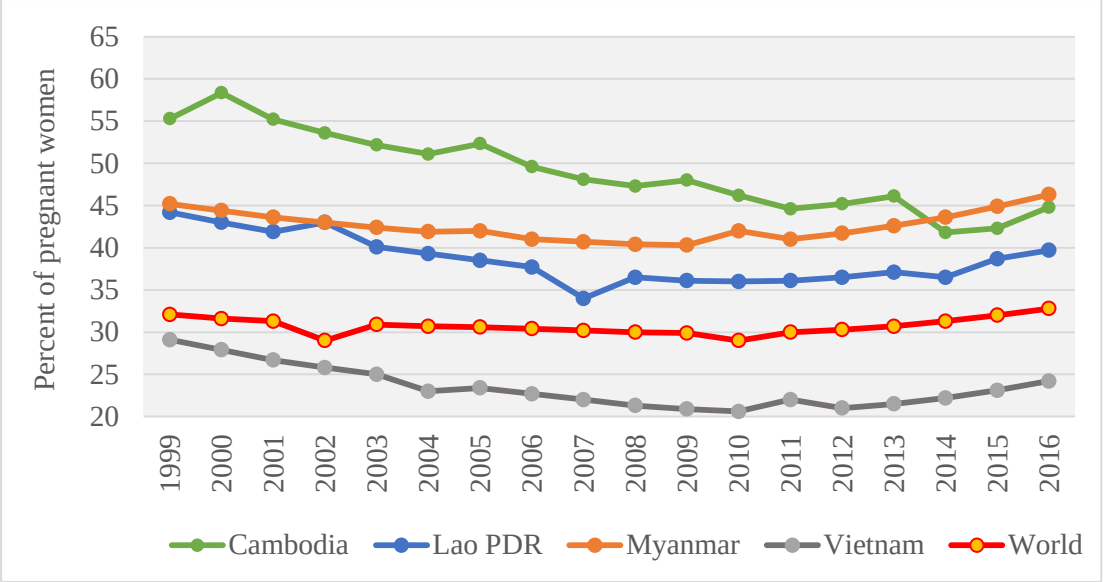


Figure (3.5) Prevalence of Anemia among Pregnant Women (%) (1999-2016)

Source: Table (3.5)

The prevalence rate in Cambodia is higher than the other counties. It shows 55% of the pregnant women has the anemia in 1999, and slightly decrease to 45% in 2016. In Lao PDR, 44% in 1999, goes down to 34% in 2007 and turn back to 40% in 2016. In Myanmar, 45% in 1999, around 40% between 2007-2010, and goes up to 46% in 2016. But in Vietnam, the rate is going down from 29% in 1999 to 20% in 2011 until slightly going up to 24% in 2016.

CHAPTER IV
MULTIPLE REGRESSION ANALYSIS OF INFANT MORTALITY

In this chapter, the multiple regression analysis was presented with the goal of having a clearer understanding of the determinants of infant mortality. When multiple regression is chosen to analyze the data, part of the process may involve checking to make sure the data that can actually be analyzed using multiple regression. There are several assumptions that are required for multiple regression to give a valid result.

4.1 Multiple Regression Analysis

The equation of the multiple regression model can be expressed as_

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + u_i$$

Where the Dependent/Outcome variable is _

Y_i = Infant Mortality Rate (per 1,000 live births), IMR

The Independent/Explanatory variables are_

X_{1i} = Female Life Expectancy at Birth (Female), LEx

X_{2i} = Female Lower Secondary Completion Rate (%), SC

X_{3i} = Female Contributing Family Workers (%), FW

X_{4i} = Prevalence of Anemia among Pregnant Women (%), PRE_ANE

And, β_0 = Intercept term which gives the mean or average effect on Y of all the variables excluded from the model although its mechanical interpretation is the average value of Y_i when $X_{1i,}$ $X_{2i,}$ X_{3i} and X_{4i} are set equal to zero. The coefficients β_1, β_2, β_3 and β_4 are called the partial regression coefficients, $X_{1i,}$ $X_{2i,}$ X_{3i} and X_{4i} are independent variables and u_i is the Error term.

The regression analysis is a set of statistical processes for estimating the relationships between independent variable and explanatory variables. Many techniques may involve for modeling and analyzing several variables when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps to understand how the dependent variable was explained when one of the independent variables is varied, while the other independent variables are constant.

Linear regression is a linear approach to modeling the relationship between dependent variable and one or more explanatory variables. In the case of one explanatory variable is called simple linear regression. When more than one explanatory variable, the process is called multiple linear regression.

When multiple regression is chosen to analyze the data, part of the process involves checking to make sure the data that can actually be analyzed using multiple regression. There are some appropriate assumptions that are required for multiple regression to give a valid result. In practice, checking for these assumptions just adds a little bit more time to the analysis.

The dependent variable should be a continuous scale either an interval or ratio. There should be no significant outliers or highly influential points to perform a multiple regression analysis. There needs to be a linear relationship between the dependent variable and each of independent variables.

Multiple linear regression necessary to be no multicollinearity in the data. It happens when the independent variables are too highly correlated with each other that may lead to problems with understanding on explanatory variables' contribution to the dependent variable, as well as technical issues to estimate a multiple regression model. Multicollinearity may be checked multiple ways. Pearson's bivariate Correlation to check a matrix of correlations among all independent variables and Variance Inflation Factor (VIF) that the linear regression indicates the degree that the variances in the regression. If VIF values higher than 10, the model has a multicollinearity problem.

The multiple linear regression analysis requires that the errors terms between observed and predicted values should be normally distributed. That can be checked by looking at a histogram or a Q-Q-Plot. It can also be checked with a goodness of fit test by using the Kolmogorov-Smirnov test. For dataset small than 2000 elements, we take the result from the Shapiro-Wilk test, otherwise the Kolmogorov-Smirnov test is

used. Since the dataset has the 18 elements, the Shapiro-Wilk test is used to interpret. When the p-value is less than 0.05, we can reject the alternative hypothesis and it can be concluded that the data comes from a normal distribution.

The data also need to be homoscedasticity, means where the variances along the line of best fit remain similar along the line. A scatterplot of residuals and predicted values is the best way to check for homoscedasticity.

Should have independence of observations (independence of residuals) which can easily check by using the Durbin-Watson (DW) test. The Durbin Watson test result reckon if there is autocorrelation in the residuals from a regression analysis. The Durbin-Watson statistic will have a value between 0 and 4. A value which is exactly 2.0 means that no autocorrelation detected in the sample. Values between 0 and 2 are state positive autocorrelation while values between 2 and 4 say negative autocorrelation.

4.2 Results for Cambodia

The multiple regression analysis for Cambodia includes aforementioned dependent variable, infant mortality rate (IMR), and the independent variables; life expectancy at birth, female, (LEx), lower secondary completion rate, female (SC), contributing family workers, female (FW) and prevalence of anemia among pregnant women (PRE_ANE).

4.2.1 Test of Normality, Infant Mortality Rate for Cambodia

The normality test has done for the dependent variable, IMR for the year 1999-2016 by using the Kolmogorov-Smirnov and Shapiro-Wilk test and the results given in Table (4.1) are 0.200 and 0.160 which are greater than 0.05, means that the IMR dataset using for Cambodia is normally distributed.

Table (4.1)

Tests of Normality (IMR) for Cambodia

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Degree of freedom	Sig.	Statistic	Degree of freedom	Sig.
IMR	0.115	18	0.200	0.925	18	0.160

4.2.2 Checking for Multicollinearity and Autocorrelation for Cambodia

By using the time series data of IMR, LEx, FW, SC, and PRE_ANE during the period of 1999 to 2016, the first estimating result of multiple regression model are shown in the following Table (4.2).

Table (4.2)

Results of Multiple Regression Model for IMR of Cambodia

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	426.014	35.069	12.148	0.000		
LEx	-5.625	0.418	-13.444	0.000	0.024	41.696
FW	-0.144	0.122	-1.184	0.258	0.024	42.407
SC	0.035	0.068	0.517	0.614	0.281	3.557
PRE_ANE	0.011	0.184	0.062	0.951	0.069	14.526
R-squared		0.998	Durbin-Watson			0.592
Adjusted R-squared		0.997	F-Statistics			1546.190
Std. Error of the Estimate		0.96443				

Source: Appendix (A1)

F-statistics (1546.190) is significant at 1% level. From the estimation results for IMR, it is found that LEx is statistically significant at 1% level but other variables (FW, SC and PRE_ANE) are not statistically significant.

In addition, it is needed to be check the multicollinearity and autocorrelation. According to the figure shown in Appendix Table (A1), Durbin-Watson, 0.592 is indicating the autocorrelation. Variance Inflation Factor (VIF) and tolerance (TOL) are the measure of multicollinearity. The VIF values of variable; 41.696, 42.407, 3.557 and 14.526 are greater than 5 except for SC. The total VIF value is also greater than 10 and it can be said that there is multicollinearity.

4.2.3 Remedy of Multicollinearity for IMR of Cambodia

If any of the independent variable included in Pearson Correlation Matrix below have a high correlation with any other independent variable, one of these variables are removed. The values of correlation among selected variables are shown in Table (4.3).

Table (4.3)

Correlation Matrix for Cambodia

		IMR	LEx	FW	SC	PRE_ANE
Pearson Correlation	IMR	1.000	-0.999	0.982	-0.821	0.960
	LEx	-0.999	1.000	-0.986	0.829	-0.961
	FW	0.982	-0.986	1.000	-0.841	0.959
	SC	-0.821	0.829	-0.841	1.000	-0.776*
	PRE_ANE	0.960	-0.961	0.959	-0.776*	1.000

* states correlation value less than 0.8.

In Table (4.3), the correlation between LEx, FW and PRE_ANE are highly correlated with each other expect SC. Among them, PRE_ANE has least correlation with SC. Therefore, LEx and FW are needed to remove from the model.

After removing LEx and FW, the results for the remained independent variables are given in Table (4.4).

Table (4.4)

Results of Multiple Regression Model for IMR of Cambodia

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	-79.408	29.373	-2.703	0.016		
SC	-0.547	0.293	-1.868	0.081	0.398	2.510
PRE_ANE	3.076	0.394	7.810	0.000	0.398	2.510
R-squared		0.936	Durbin-Watson		1.546	
Adjusted R-squared		0.927	F-Statistics		109.328	
Std. Error of the Estimate		4.967				

Source: Appendix (A1)

According to Table (4.4), the VIF values of each variable are 2.510 and the total VIF value is 5.020 which is less than 10 and TOL values are 0.398 each. Therefore, the estimation results give an acceptable level of collinearity and assumes

that there is no multicollinearity. In addition, the Durbin-Watson result 1.546 indicates that there is no autocorrelation in this model.

The estimated regression model for IMR of Cambodia is_

IMR = - 79.408 - 0.547 SC + 3.076 PRE_ANE (4.1)

Se = (29.373) (0.293) (0.394)

t = (-2.703) (-1.868) (7.810) The adjusted R^2 = 0.927

From the estimation results for IMR, SC is statistically significant at 10% level while PRE_ANE is significant at 1% level. It is found that IMR has a negative relation with SC. The interpretation can be found as follow for the regression coefficient, -0.547 of SC, with the influence of PRE_ANE held constant, that 5.470 infant dead per 1,000 live births will decline if 10 percent of SC increases. It is also found that IMR has a positive relation with PRE_ANE. IMR will increase by 3.076 infant dead if PRE_ANE increase by one percent. The model is statistically significant at 1% level (F =109.328). Nearly 92.7 % of the variation of dependent variable is explained by the variation of independent variables.

4.2.4 Checking for Heteroscedasticity for Cambodia

By using the selected variables, IMR, SC and PRE_ANE, White's General Heteroscedasticity test is used to determine the problem of Heteroscedasticity. The following Table (4.5) shows the White's General Heteroscedasticity results.

Table (4.5)

White's General Heteroscedasticity Test Results for Cambodia

Chi-Square	df	Sig.
0.981	5	0.964

a. Dependent variable: IMR

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Design: Intercept + SC + PRE_ANE + SC * SC + SC * PRE_ANE + PRE_ANE * PRE_ANE

Since the P-value (0.964) is greater than the significance level (0.05), the evidence shows to accept the null hypothesis that the variance of the errors does not depend on the values of the independent variables. Therefore, heteroscedasticity does not exist in the selected data.

4.2.5 The Residual Normality Test for Cambodia

The results of the normality test for the residual of the model are shown in Figures (A-1.1) and (A-1.2).

4.2.6 The Estimation Results for Cambodia

Based on the selected Model, the estimated IMR for Cambodia is shown in Appendix Table (A5). It can be seen that the estimated results are close to the original Infant Mortality Rate for each year.

4.3 Results for Lao PDR

The multiple regression analysis for Lao PDR also includes aforementioned dependent variable, IMR, and the independent variables; LEx, SC, FW and PRE_ANE.

4.3.1 Test of Normality for Lao PDR

The normality test has done for the dependent variable, IMR by using the Kolmogorov-Smirnov and Shapiro-Wilk test and the results given in Table (4.6) are 0.200 and 0.480 which are greater than 0.05, means that the IMR dataset using for Lao PDR is normally distributed.

Table (4.6)

Tests of Normality (IMR) for Lao PDR

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Degree of freedom	Sig.	Statistic	Degree of freedom	Sig.
IMR	0.092	18	0.200	0.953	18	0.480

4.3.2 Checking for Multicollinearity and Autocorrelation for Lao PDR

By using the time series data of IMR, LEx, FW, SC, and PRE_ANE during the period of 1999 to 2016, the first estimating result of multiple regression model are shown in the following Table (4.7).

Table (4.7)

Results of Multiple Regression Model for IMR of Lao PDR

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	341.875	1.757	194.591	.000		
LEx	-4.386	.018	-246.922	.000	.067	14.933
SC	-.009	.004	-2.455	.029	.125	8.030
PRE_ANE	.045	.011	4.271	.001	.172	5.804
FW	-.036	.013	-2.682	.019	.279	3.587
R-squared		1.000	Durbin-Watson			2.165
Adjusted R-squared		1.000	F-Statistics			232807.512
Std. Error of the Estimate		.05237				

Source: Appendix (A2)

From the estimation results for IMR, it is found that the independent variables are statistically significant at 5% level. IMR has a negative relation with LEx, FW and SC whereas IMR has a positive relation with PRE_ANE. The interpretation can be found as follow for the regression coefficient, -4.386 of LEx with the influence of other variables held constant, tells that 4.386 infant dead per 1,000 live births will decline if one year of LEx increases. Similarly, the regression coefficient, -0.036 of FW with the influence of other variables held constant, tells that 0.036 infant dead per 1,000 live births will decline if one percent of FW increases. Also, the regression coefficient, -0.009 of SC with the influence of other variables held constant, tells that 0.009 infant dead per 1,000 live births will decline if one percent of SC increases. Inversely, the regression coefficient, 0.045 of PRE_ANE with the influence of other variables held constant, that 0.045 infant dead per 1,000 live births will raise if one percent of PRE_ANE increases.

The model is statistically significant at 1% level (F-statistics = 232807.512). According to Durbin-Watson, 2.165 is indicating there is no autocorrelation. The VIF values of variables; 14.933, 8.030, 5.804 and 3.587 are greater than 5 except FW. Therefore, total VIF value is also greater than 10 and it can be said that there is multicollinearity. (See Appendix Table A2)

4.3.3 Remedy of Multicollinearity for IMR of Lao PDR

If any of the independent variable included in Pearson Correlation Matrix below have a high correlation with any other independent variable, one of these variables are removed. The values of correlation among selected variables are shown in Table (4.8).

Table (4.8)

Correlation Matrix for Lao PDR

		IMR	LEx	SC	PRE_ANE	FW
Pearson Correlation	IMR	1.000	-1.000	-0.875	0.705*	0.489*
	LEx	-1.000	1.000	0.877	-0.698*	-0.496*
	SC	-0.875	0.877	1.000	-0.385*	-0.692*
	PRE_ANE	0.705	-0.698*	-0.385*	1.000	-0.140*
	FW	0.489*	-0.496*	-0.692*	-0.140*	1.000

* states correlation value less than 0.8.

In Table (4.8), the correlation between LEx is highly correlated with Female SC whilst other variables, FW and PRE_ANE are satisfied. Therefore, LEx is initially considered to remove from the model. After removing LEx, the results for the remained independent variables are given in Table (4.9).

Table (4.9)

Results of Multiple Regression Model for Lao PDR

Variable	**Coefficient**	**Std. Error**	**t - Statistics**	**Sig.**	**TOL**	**VIF**
(Constant)	-48.610	50.516	-.962	0.352		
SC	-0.700	0.163	-4.288	0.001	0.284	3.523
FW	1.226	0.814	1.506	0.154	0.327	3.061
PRE_ANE	2.200	0.397	5.537	0.000	0.534	1.872
R-squared		0.935	Durbin-Watson			1.745
Adjusted R-squared		0.920	F-Statistics			66.595
Std. Error of the Estimate		3.45644				

Source: Appendix (A2)

According to Table (4.9), the VIF values of each variable are 3.523, 1.872 and 3.061 and the total VIF value is 8.456 which is less than 10 and TOL values are 0.284, 0.534 and 0.327 each. Therefore, the estimation results give an acceptable level of collinearity and assumes that there is no multicollinearity. In addition, the Durbin-Watson result 1.745, indicate that there is no autocorrelation in this model.

The estimated regression model for IMR of Lao PDR is_

IMR =	- 48.610	- 0.700 SC	+ 1.226 FW	+ 2.200 PRE_ANE	(4.2)
Se =	(50.516)	(0.163)	(0.814)	(0.397)	
t =	(-0.962)	(-4.288)	(1.506)	(5.537)	

The Adjusted R^2= 0.920

From the estimation results for IMR, SC, and PRE_ANE are statistically significant at 1% level. It is found that IMR has a positive relation with both FW, and PRE_ANE while SC has a negative relation with dependent variable. The interpretation can be found as follow for the regression coefficient, -0.7 of SC, with the influence of other variables held constant, that 0.700 infant dead per 1,000 live births will decline if one percent of SC increases. Inversely, IMR will increase by 2.2 infant dead if PRE_ANE by one percent. The model is statistically significant at 1% level (F= 66.595). Nearly 92 % of the variation of dependent variable is explained by the variation of independent variables.

4.3.4 Checking for Heteroscedasticity for Lao PDR

By using the selected variables, IMR, SC, FW and PRE_ANE, the following Table (4.10) shows the White's General Heteroscedasticity results.

Table (4.10)

White's General Heteroscedasticity Test Results for Lao PDR

Chi-Square	df	Sig.
14.852	9	0.095

a. Dependent variable: IMR

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Design: Intercept + SC + PRE_ANE + FW + SC * SC + SC * PRE_ANE + SC * FW + PRE_ANE * PRE_ANE + PRE_ANE * FW + FW * FW

Since the P-value (0.095) is greater than the significance level (0.05), the evidence shows to accept the null hypothesis that the variance of the errors does not depend on the values of the independent variables. Therefore, heteroscedasticity does not exist in the selected data.

4.3.5 Checking for the Residual Normality Test for Lao PDR

The results of the normality test for the residual of the model are shown in Figures (A-2.1) and (A-2.2).

4.3.6 The Estimation Results for Lao PDR

Based on the selected Model, the estimated IMR for Lao PDR is shown in Appendix Table (A5). It can be seen that the estimated results are close to the original IMR for each year.

4.4 Results for Myanmar

The multiple regression analysis for Myanmar also includes aforementioned dependent variable, IMR and the independent variables; LEx, SC, FW and PRE_ANE.

4.4.1 Test of Normality for Myanmar

The normality test has done for the dependent variable, IMR by using the Kolmogorov-Smirnov and Shapiro-Wilk test and the results given in Table (4.11) are 0.200 and 0.387 which are greater than 0.05, means that the IMR dataset using for Myanmar is normally distributed.

Table (4.11)

Tests of Normality (IMR) for Myanmar

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Degree of freedom	Sig.	Statistic	Degree of freedom	Sig.
IMR	0.106	18	0.200	0.947	18	0.387

4.4.2 Checking for Multicollinearity and Autocorrelation for Myanmar

By using the time series data of IMR, LEx, FW, SC, and PRE_ANE during the period of 1999 to 2016, the first estimating result of multiple regression model are shown in the following Table (4.12).

Table (4.12)

Results of Multiple Regression Model for IMR of Myanmar

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	283.447	48.883	5.798	0.000		
LEx	-3.421	0.816	-4.195	0.001	0.024	42.457
SC	-0.175	0.198	-0.881	0.394	0.034	29.012
FW	0.151	0.215	0.702	0.495	0.198	5.041
PRE_ANE	-0.024	0.167	-0.141	0.890	0.821	1.217
R-squared		0.988	Durbin-Watson			2.150
Adjusted R-squared		0.985	F-Statistics			272.926
Std. Error of the Estimate		1.09486				

Source: Appendix (A3)

From the estimation results for IMR, LEx is statistically significant at 1% level while other independent variables are not statistically significant at 10% level. It is found a negative relation with LEx. The interpretation can be done as follow for the regression coefficient, -3.421 of LEx with the influence of other variables held constant, that 3.421 infant dead per 1,000 live births will decline if one year of LEx increases. However, F-statistics (272.926) is significant at 1%. According to the figure shown in Appendix, Durbin-Watson, 2.150 is indicating there is no autocorrelation. The VIF values of variable; 42.457, 29.012, and 5.041 are greater than 5 except PRE_ANE. Therefore, total VIF value is also greater than 10 and it can be said that there is multicollinearity.

4.4.3 Remedy for Multicollinearity for IMR of Myanmar

If any of the independent variable included in Pearson Correlation Matrix below have a high correlation with any other independent variable, one of these variables are removed. The values of correlation among selected variables are shown in Table (4.13).

Table (4.13)

Correlation Matrix for Myanmar

		IMR	**LEx**	**SC**	**PRE_ANE**	**FW**
Pearson Correlation	IMR	1.000	-0.994	-0.960	-0.053	0.711
	LEx	-0.994	1.000	0.962	0.054*	-0.713*
	SC	-0.960	0.962	1.000	0.114*	-0.546*
	PRE_ANE	-0.053	0.054*	0.114*	1.000	0.247*
	FW	0.711	-0.713*	-0.546*	0.247*	1.000

* states correlation value less than 0.8.

In Table (4.13), the correlation between LEx is highly correlated with SC whilst the correlation of other variables, FW, SC and PRE_ANE are satisfied. In that case, only LEx is initially selected to remove from the model.

After removing LEx, the results for the remained independent variables are given in Table (4.14).

Table (4.14)

Results of Multiple Regression Model for IMR of Myanmar

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	80.308	9.829	8.170	0.000		
SC	-0.982	0.068	-14.423	0.000	0.637	1.571
FW	0.892	0.182	4.896	0.000	0.606	1.651
PRE_ANE	-0.155	0.243	-0.639	0.533	0.851	1.175
R-squared		0.972	Durbin-Watson			1.845
Adjusted R-squared		0.966	F-Statistics			163.837
Std. Error of the Estimate		1.61851				

Source: Appendix (A3)

According to Table (4.14), the VIF values of each variable are 1.571, 1.175 and 1.651 and the total VIF value is 4.396 which is less than 10 and TOL values are 0.637, 0.851 and 0.606 each which are close to 1. Therefore, the estimation results give an acceptable level of collinearity and assumes that there is no multicollinearity. In addition, the Durbin-Watson result 1.845, indicate that there is no autocorrelation in this model.

The estimated regression model for IMR of Myanmar is_

IMR =	80.308	– 0.982 SC	+ 0.892 FW	- 0.155 PRE_ANE	(4.3)
Se =	(9.829)	(0.068)	(0.182)	(0. 243)	
t =	(8.170)	(-14.423)	(4.896)	(-0.639)	

The Adjusted $R^2 = 0.966$

From the estimation results for IMR, although FW, and SC are statistically significant at 1% level, PRE_ANE is not statistically significant at 10% level. It is found that IMR has a positive relation with FW, while it has a negative relation with SC. The interpretation can be found as follow for the regression coefficient, 0. 892 of FW, with the influence of SC held constant, tells that 0. 892 infant dead per 1,000 live births will raise if one percent of FW increases. Inversely, IMR will decline by 0. 982 infant dead if SC increase by one percent. The model is statistically significant at 1% level (F =163.837). Nearly 96.6 % of the variation of dependent variable is explained by the variation of independent variables. (See Appendix Table A3)

4.4.4 Checking for Heteroscedasticity for Myanmar

By using the selected variables, IMR, FW and SC, White's General Heteroscedasticity test is used to determine the problem of Heteroscedasticity. The following Table (4.15) shows the White's General Heteroscedasticity results.

Table (4.15)

White's General Heteroscedasticity Test Results for Myanmar

Chi-Square	df	Sig.
8.574	9	0.477

a. Dependent variable: IMR

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Design: Intercept + SC + PRE_ANE + FW + SC * SC + SC * PRE_ANE + SC * FW + PRE_ANE * PRE_ANE + PRE_ANE * FW + FW * FW

Since the P-value (0.477) is greater than the significance level (0.05), the evidence shows to accept the null hypothesis that the variance of the errors does not depend on the values of the independent variables. Therefore, heteroscedasticity does not exist in the selected data.

4.4.5 Checking for the Residual Normality Test for Myanmar

The results of the normality test for the residual of the model are shown in Figures (A-3.1) and (A-3.2).

4.4.6 The Estimation Results for Myanmar

Based on the selected Model, the estimated IMR for Myanmar is shown in Appendix Table (A5). It can be seen that the estimated results are close to the original Infant Mortality Rate for each year.

4.5 Results for Vietnam

The multiple regression analysis for Vietnam also includes aforementioned dependent variable, IMR and the independent variables; LEx, SC, FW and PRE_ANE.

4.5.1 Test of Normality for Vietnam

The normality test has done for the dependent variable, IMR by using the Kolmogorov-Smirnov and Shapiro-Wilk test and the results given in Table (4.16) are 0.200 and 0.077 which are greater than 0.05, means that the Infant Mortality Rate dataset using for Vietnam is normally distributed.

Table (4.16)

Tests of Normality (IMR) for Vietnam

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Degree of freedom	Sig.	Statistic	Degree of freedom	Sig.
IMR	0.145	18	0.200	0.907	18	0.077

4.5.2 Checking for Multicollinearity and Autocorrelation for Vietnam

By using the time series data of IMR, LEx, FW, SC, and PRE_ANE during the period of 1999 to 2016, the first estimating result of multiple regression model are shown in the following Table (4.17).

Table (4.17)

Results for Multiple Regression Model for IMR of Vietnam

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	319.753	30.988	10.318	0.000		
LEX	-3.856	0.393	-9.807	0.000	0.028	35.269
FW	-0.027	0.009	-2.941	0.011	0.084	11.911
SC	-0.006	0.012	-0.497	0.628	0.089	11.280
PRE_ANE	0.189	0.042	4.493	0.001	0.115	8.660
R-squared		0.997	Durbin-Watson			1.447
Adjusted R-squared		0.995	F-Statistics			935.412
Std. Error of the Estimate		0.147				

Source: Appendix (A4)

From the estimation results for IMR, although SC is not statistically significant even at 10% level, other independent variables; LEx, FW are statistically significant at 1% level and PRE_ANE is significant at 5% level. It is found that IMR has a negative relation with LEx, FW whereas IMR has a positive relation with PRE_ANE. The interpretation can be found as follow for the regression coefficient, -3.856 of LEx with the influence of other variables held constant, that 3.856 infant dead per 1,000 live births will decline if one year of LEx increases. Similarly, the regression coefficient, -0.027 of FW with the influence of other variables held constant, that 0.027 infant dead per 1,000 live births will decline if one percent of FW increases. Inversely, the regression coefficient, 0.189 of PRE_ANE with the influence of other variables held constant, that 0.189 infant dead per 1,000 live births will raise if one percent of PRE_ANE increases. The model is statistically significant at 1% level (F= 935.412). The VIF values of variable; 35.269, 11.911, 11.280 and 8.660 are greater than 5 Therefore, total VIF value is also greater than 10 and it can be said that there is multicollinearity.

4.5.3 Remedy for Multicollinearity for IMR of Vietnam

If any of the independent variable included in Pearson Correlation Matrix below have a high correlation with any other independent variable, one of these variables are removed. The values of correlation among selected variables are shown in Table (4.18).

Table (4.18)

Correlation Matrix for Vietnam

		IMR	SC	PRE_ANE	FW	LEx
Pearson Correlation	IMR	1.000	-0.823	0.865	0.940	-0.992
	SC	-0.823	1.000	-0.472*	-0.775*	0.865
	PRE_ANE	0.865	-0.472*	1.000	0.837	-0.815
	FW	0.940	-0.775*	0.837	1.000	-0.951
	LEx	-0.992	0.865	-0.815	-0.951	1.000

* states correlation value less than 0.8.

In Table (4.18), the correlation between LEx, FW and SC have highly correlated each other while the correlation between SC and PRE_ANE is low. Table (4.17) shows the 3 highest VIF values and decided to remove the 2 highest variables.

Therefore, Female LEx and FW are selected to remove from the model. After removing LEx and FW, the results for the remained independent variables are given in Table (4.19).

Table (4.19)

Results of Multiple Regression Model for Vietnam

Variable	Coefficient	Std. Error	t - Statistics	Sig.	TOL	VIF
(Constant)	16.103	1.646	9.783	0.000		
SC	-0.116	0.011	-10.422	0.000	0.777	1.286
PRE_ANE	0.536	0.045	11.947	0.000	0.777	1.286
R-squared		0.969	Durbin-Watson			1.922
Adjusted R-squared		0.965	F-Statistics			237.277
Std. Error of the Estimate		0.408				

Source: Appendix (A4)

According to Table (4.19), the VIF values of each variable are 1.286and the total VIF value is 2.573 which is less than 10 and TOL values are 0. 777each which are close to 1. Therefore, the estimation results give an acceptable level of collinearity and assumes that there is no multicollinearity. In addition, the Durbin-Watson result 1. 922, indicate that there is no autocorrelation in this model.

The estimated regression model for IMR of Vietnam is_

IMR = 16.103 - 0.116 SC + 0.536 PREANE (4.4)

Se = (1.646) (0.011) (0. 045)

t = (9.783) (-10.422) (11.947) The Adjusted R^2= 0.965

From the estimation results for IMR, it is found that IMR has a positive relation with PRE_ANE, while it has a negative relation with SC. The interpretation can be found as follow for the regression coefficient, 0.536 of PRE_ANE, with the influence of SC held constant, that 0. 536 infant dead per 1,000 live births will raise if one percent of PRE_ANE increases. Inversely, IMR will decline by 0. 116 infant dead if SC increase by one percent.

Both PRE_ANE and SC are statistically significant at 1% level of significance. The model is statistically significant at 1% level (F =237.277). Nearly

96.5 % of the variation of dependent variable is explained by the variation of independent variables.

4.5.4 Checking for Heteroscedasticity for Vietnam

By using the selected variables, IMR, PRE_ANE and SC, White's General Heteroscedasticity test is used to determine the problem of Heteroscedasticity. The following Table (4.20) shows the White's General Heteroscedasticity results.

Table (4.20)

White's General Heteroscedasticity Test Results for Vietnam

Chi-Square	df	Sig.
5.746	5	0.332

a. Dependent variable: IMR

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

c. Design: Intercept + SC + PREANE + SC * SC + SC * PREANE + PREANE * PREANE

Since the P-value (0.332) is greater than the significance level (0.05), the evidence shows to accept the null hypothesis that the variance of the errors does not depend on the values of the independent variables. Therefore, heteroscedasticity does not exist in the selected data.

4.5.5 Checking for the Residual Normality Test for Vietnam

The results of the normality test for the residual of the model are shown in Figures (A-4.1) and (A-4.2).

4.5.6 The Estimation Results for Vietnam

Based on the selected Model, the estimated IMR for Vietnam is shown in Appendix Table (A5). It can be seen that the estimated results are close to the original Infant Mortality Rate for each year.

CHAPTER V
CONCLUSION

5.1 Findings

This study explored the impact of several socio-economic and behavioral characteristics on the rate of IMR in the CLMV countries. The explanatory variables of IMR are FW, SC, and PRE_ANE.

The governments of Cambodia, the Lao PDR, Myanmar, and Viet Nam (CLMV) have been committed to health-for-all through the provision of basic health care. CLMV countries have invested the public health systems since 1980s. During basic infrastructure is taking in place, quality and affordability remain challenges. CLMV countries are committed to the SDGs indicators. The goals to continuously improve basic health services and population health outcomes are part of it. CLMV countries have generally improved in child and infant mortality reduction.

After achieving peace and national reconciliation through the 1991 Paris Accord and the 1993 General Election, Cambodia has enjoyed macroeconomic and political stability for the past 10 years. Despite the development challenges remain including high poverty rate, the income gap, low production base, and poor human resources. The country still poor and governance weaknesses limit both critical spending and the environment for broad-based development. Though the decline in poverty has been significant and widespread due to the rise in average per capita consumption, Cambodia is still facing a major challenge in having high poverty rate.

In fact, according to the estimation results shows that IMR in Cambodia has an inverse relation with SC while PRE_ANE has the direct relation with dependent variable.

If the SC in Cambodia increases by 10 percent, the IMR will raise by 5.47 infants per 1,000 live births. Inversely, if PRE_ANE increases by one percent, the IMR will raise by 3.076 infant death per 1,000 live births. The trend of SC is

increasing for 18 years (1999 to 2016) while PRE_ANE is decreasing during the study period.

Although the achievements attained in the five-year period (2001-2005) in Lao PDR are highly positive and praiseworthy, a number of challenges and constraints still remain. The skill level of the labor force is developing slowly compared to the improvements in the economic components in each sector and area. The capacity development of the labor force is characterized by self-improvement, with only occasional opportunities for training, resulting in casual labor. In the education and training sector, repetition and dropout rates are high and increasing. Due to the low quality of graduates, few are accepted in the labor market, while the remainder are forced to work in sectors other than their areas of training. The literacy rate remains very low.

This study investigated that explanatory variable, PRE_ANE have a positive relation with the IMR whereas SC has a negative relation with the dependent variable. When SC increase by one percent, the IMR will go down by 0.7 infant death per 1,000 live births. Also, If PRE_ANE increases by one percent, the IMR will increase by 2.2 infant death. SC in Lao PDR is increasing from 27% to 64 % during 1999 to 2016. Meanwhile, PRE_ANE is slightly decreased from 44% in 1999 to 39.7 % in 2016.

The success of ASEAN economy reflects every facet of growth of Myanmar economy. Achieving sustainable development, developing the financial sector, and establishing the development fundamentals are essential measures to be undertaken for a comprehensive development of Myanmar. At the transition stage, Myanmar has declared that its development strategies are regionally feasible. The concept of development and its challenges are moving to new directions as improving the quality of life and providing better education, higher standards in health and nutrition to reduce poverty, and adopting a richer cultural life and globalization.

In this study, the regression estimation explained that SC has a negative relation with IMR while FW has a positive relation with dependent variable. If SC increase by one percent, the IMR will decline by 0.982 infant death per 1,000 live births. Inversely, if FW increase by one percent, the IMR will also increase by 0.892 infant death. During the studied period (1999-2016), FW is declining until 2015 but it increases in 2016 that should be monitored for the future. However, SC is increasing during the study period, 18 years.

Vietnam has made a number of efforts to reform its economy since 1986 and has recorded the significant socioeconomic improvements since 1990 with an important view to proactively engage in international economic integration, has brought about important socioeconomic achievements. However, Vietnam is still facing many challenges, such as low competitiveness, limited quality of growth, low level of industrialization, and risks of macroeconomic and social instability. The regional income disparity seems to be increasing. Despite nationwide reduction, poverty incidence persists at high level in the isolated and ethnic regions. Another phenomenon is the "new poor" referring to migrants and farmers who lost land in the process of industrialization and urbanization. Job training and retraining in these cases turned out to be insufficiently effective. Thus, new directions should be identified and pursued to deal with this group of poor people.

In all, Vietnam can take pride in what it has achieved so far. From its starting point with enormous difficulties resulting from the wars, the country has speed up the socioeconomic development. Regardless of the occasional failures, Vietnam has been on its right way to development. Although weaknesses still remain, it becomes clearer as the market economy in Vietnam is better shaped

According to the estimation results, the independent variables, IMR in Vietnam has an inverse relation with SC while PRE_ANE has the direct relation with dependent variable. If SC increase by one percent, the IMR will decrease by 0.116 infant death per 1,000 live births. Inversely, if PRE_ANE increase by one percent, the IMR will also increase by 0.536 infant death. The SC in Vietnam is increasing from 1999 to 2016 while PRE_ANE is going down until 2009 and slightly increase in 2011 which should be monitored closely.

5.2 Recommendations

Infant health continues being a priority for countries and the world. National and local governments, NGOs, Civil Society and the general public should continue paying attention to the health of infant and children population. Many efforts should continuously be putting to improve the quality of life, access to high quality health service and education to remove risk factors and improve the determinants of infant health. The explanatory variable, Female Secondary School Completion Rate (SC) proved how the education level of mother is influence on the Infant Mortality. The social and human capital that educational attainment provides women enables them to better care of their child. It is surprised that Female Contributing Family Workers (FW) tells that if Female Contributing Family Workers (FW) who holds a self-employment job in a market-oriented establishment operated by a related person living in the same household increase, the Infant Mortality will increase. Many families with young children must make a choice between spending a significant portion of their income on childcare, finding a cheaper, but potentially lower-quality care option, or leaving the workforce altogether to become a full-time caregiver. Whether due to high cost, limited availability, or inconvenient program hours, childcare challenges are driving parents out of the workforce at an alarming rate. By monitoring Female Contributing Family Workers (FW) at the certain level, Infant Mortality will also control. The study explored that if Prevalence of Pregnancy Anemia (PRE_ANE) increases, the Infant Mortality will go up. Therefore, this is also a concern that need to improve the maternal health care by reducing the Prevalence of Pregnancy Anemia (PRE_ANE).

5.3 Further Study

In this study, the availability of variables is challenging since it is considered for 4 countries. If there is a chance to do further study on the determinants of Infant Mortality, it would be great to include the Mother's Literacy Rate, the coverage of Post and Prenatal Care, Adolescent Fertility Rate, Abortion Rate, Low Birth Rate, Incidence of Smoking and Incidence of Pregnancy HIV. Also, it is recommended to study for Sub-National Level, State and Region or Township because by focusing one country more common dataset can be available.

REFERENCES

1. Anyanwa, J.C., & Erhijakpor, E.O. (2009). Health expenditures and health outcomes in africa. *African Development Review, 21*(2), 400–433.
2. Bauman, K.E., & Anderson, A.E. (1980). *Legal abortions and trends in fetal and infant mortality rates in the united states*
3. Breschi M. , R. Derosas, M. Manfredini (2000) Infant Mortality in 19th Century Italy.
4. Chap Sotharith (2007), *Development Strategy for CLMV in the Age of Economic Integration*
5. Cornelia Kaldewei (2010), *Determinants of Infant and Under-Five Mortality* – The Case of Jordan
6. Cornelius, N., Masanja, H., & Klipstein-Grobusch, K. (2013). *Relationship between household socio-economic status and under-five mortality in Rufiji DSS,* Tanzania. Glob Health Action (6)
7. Daniel Kim and Adrianna Saada (2013), *The Social Determinants of Infant Mortality and Birth Outcomes in Western Developed Nations:* A Cross-Country Systematic Review
8. Dawood Mamoon, Sidra Raza And Noman Arshed (2011) *Impact of Health CapitaLand Education on Infant Mortality Rate of Districts of Punjab*
9. Eberstadt, N. (1991). America's infant-mortality puzzle. *The Public Interest*, (105), 30-47.
10. Engin Erdogan, Meliha Ener, Feyza Arica (2013), *The Strategic Role of Infant Mortality in the Process of Economic,* An Application for High Income OECD Countries
11. Faith Conroy (2015), *Determinants of Infant Mortality Rate:* A Cross National Study
12. Gordon, R. M. (2009). Socio-economic Determinants of Infant and Child Mortality in Haiti. *Journal Of Eastern Caribbean Studies, 34*(1), 1-18.
13. Grossman, M., & Jacobowitz , S. (1981). *Variations in infant mortality rates among counties of the united states:* the role of public policies and programs. Demography, 18 (4), 695-713.

14. Interactions between Ecology and Society", in: *Population and Economy: From Hunger to Modern Economic Growth*, Bengtsson T., Saito O. (eds.), Oxford, 457-489.
15. Jayant Menon (2012), *Narrowing the Development Divide in ASEAN:The Role of Policy*
16. John Ross Costa (2009), *Determinants of The Infant Mortality Rate in The United States*
17. Judith H Wolleswinkel-van den Bosch,a Frans WA van Poppel,b Caspar WN Loomanaand Johan P Mackenbacha (2000), *Determinants of infant and early child hood mortality levels and their decline in the Netherlands in the late nineteenth century*
18. Lal Hrin Mawi (2018), *Factors Associated with Infant and Under-five Mortalities in Myanmar*
19. Maw Maw Khin (1991), *Determination of Indicators to monitor the basic education system*
20. Mr. David Sinate, Mr. Vanlalruata Fanai, Ms. Sara Joy, Manager, Ms. Srejita Nandy, Deputy Manager (2018), *Enhancing India's Engagement in Healthcare Sector of CLMV Countries*
21. Nurlaily Febriyuna (2015), *Determinants of Infant Mortality in Indonesia*
22. Osayanmon Wellington Osawe (2014), *Determinant of Infant Mortality Rate:* A Panel Data Analysis of African Countries
23. Pan Ei San Thein (2015), *A study on Trend of Infant Mortality Rates in Myanmar (1995-2013)*
24. Rubee Dev (2014), *Topographical Differences of Infant Mortality in Nepal:* Demographic and Health Survey 2011
25. Rutstein, S. O. (2000). Factors associated with trends in infant and child mortality in developing countries during the 1990s. *Bulletin of the World Health Organization*, *78*(10), 1256–1270.
26. Sunday Adepoju Aedine (2013), *Contextual Determinants of Infant and Child Mortality in Nigeria*
27. W.Henry Mposley, Lincoln C. Chen ((1984), *An Analytical Framework for the study of Child Survival in Developing Countries*
28. Ye Htut (2016), *Estimation of mortality in Myanmar (2014)*

WEBSITES

1. http://www.wpro.who.int
2. https://www.ncbi.nlm.nih.gov
3. https://dhsprogram.com
4. https://www.who.int
5. https://apps.who.int
6. https://economictimes.indiatimes.com
7. http://www.eria.org
8. https://www.un.org
9. https://www.researchgate.net
10. https://pdfs.semanticscholar.org
11. https://www.adb.org
12. https://onlinelibrary.wiley.com
13. http://csus-dspace.calstate.edu
14. https://cuir.car.chula.ac.th
15. https://www.eximbankindia.in
16. https://www.semanticscholar.org
17. http://wiredspace.wits.ac.za
18. https://data.worldbank.org

APPENDIX A – 1

Analysis Results for Cambodia

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.999[a]	.998	.997	.96443	.592

a. Predictors: (Constant), PREANE, SC, LEXfe, FW

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5752.633	4	1438.158	1546.190	.000[b]
	Residual	12.092	13	.930		
	Total	5764.725	17			

a. Dependent Variable: IMR

b. Predictors: (Constant), PREANE, SC, LEXfe, FW

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	426.014	35.069		12.148	.000		
	LEX	-5.625	.418	-1.103	-13.444	.000	.024	41.696
	FW	-.144	.122	-.098	-1.184	.258	.024	42.407
	SC	.035	.068	.012	.517	.614	.281	3.557
	PREANE	.011	.184	.003	.062	.951	.069	14.526

a. Dependent Variable: IMR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.967[a]	.936	.927	4.96707	1.546

a. Predictors: (Constant), PREANE, SC

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5394.649	2	2697.324	109.328	.000[b]
	Residual	370.076	15	24.672		
	Total	5764.725	17			

a. Dependent Variable: IMR

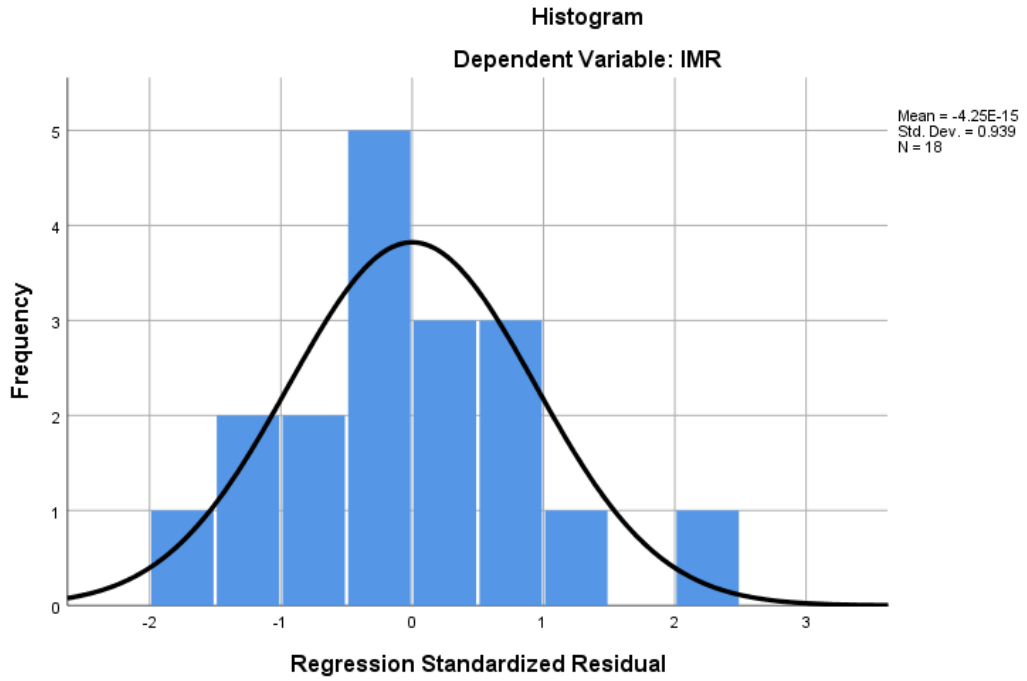
b. Predictors: (Constant), PREANE, SC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-79.408	29.373		-2.703	.016		
	SC	-.547	.293	-.194	-1.868	.081	.398	2.510
	PREANE	3.076	.394	.809	7.810	.000	.398	2.510

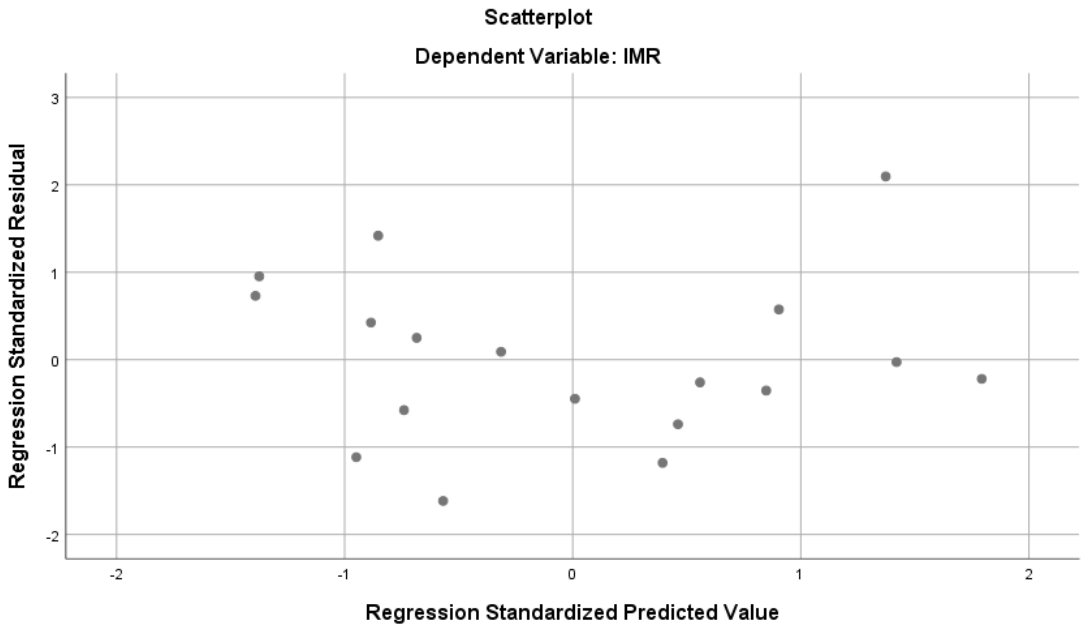
a. Dependent Variable: IMR

Figure (A-1.1) Histogram of the Standardized Residual for Cambodia



Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	.092	18	.200*	.985	18	.985

Figure (A-1.2) Scatterplot of the Standardized Residual for Cambodia



APPENDIX A – 2

Analysis Results for Lao PDR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	1.000[a]	1.000	1.000	.05237	2.165

a. Predictors: (Constant), FW, PREANE, SC, LEXfe

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2554.049	4	638.512	232807.512	.000[b]
	Residual	.036	13	.003		
	Total	2554.084	17			

a. Dependent Variable: IMR

b. Predictors: (Constant), FW, PREANE, SC, LEXfe

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	341.875	1.757		194.591	.000		
	LEX	-4.386	.018	-.989	-246.922	.000	.067	14.933
	SC	-.009	.004	-.007	-2.455	.029	.125	8.030
	PREANE	.045	.011	.011	4.271	.001	.172	5.804
	FW	-.036	.013	-.005	-2.682	.019	.279	3.587

a. Dependent Variable: IMR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.967[a]	.935	.920	3.45644	1.745

a. Predictors: (Constant), FW, PREANE, SC

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2386.827	3	795.609	66.595	.000[b]
	Residual	167.258	14	11.947		
	Total	2554.084	17			

a. Dependent Variable: IMR

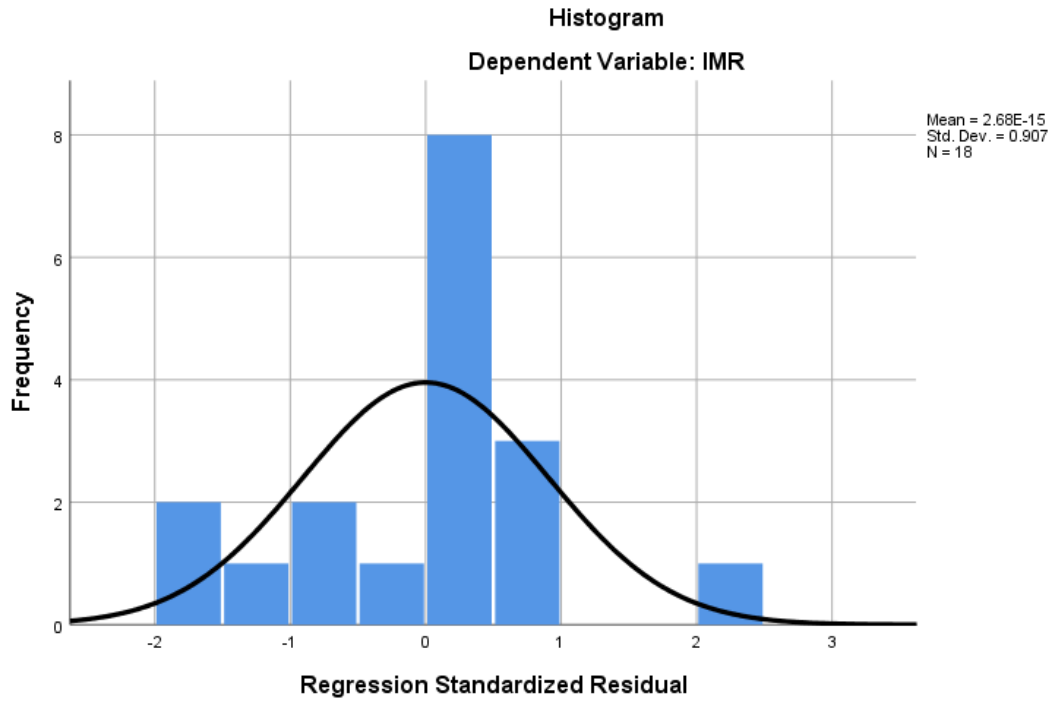
b. Predictors: (Constant), FW, PREANE, SC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-48.610	50.516		-.962	.352		
	SC	-.700	.163	-.550	-4.288	.001	.284	3.523
	PREANE	2.200	.397	.518	5.537	.000	.534	1.872
	FW	1.226	.814	.180	1.506	.154	.327	3.061

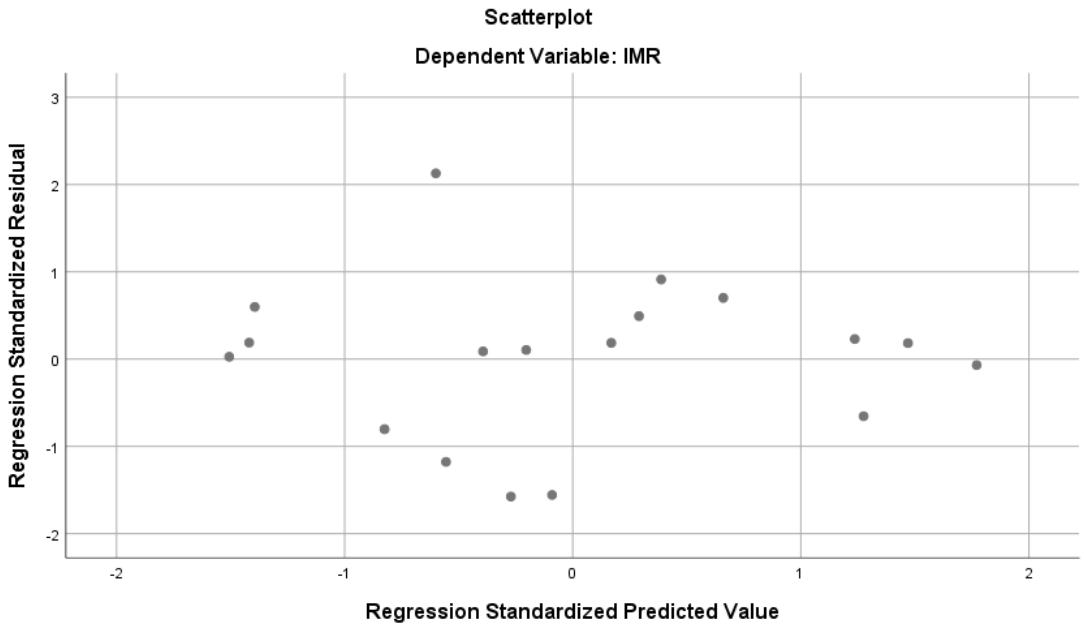
a. Dependent Variable: IMR

Figure (A-2.1) Histogram of the Standardized Residual for Lao PDR



Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	0.192	18	0.078	0.933	18	0.217

Figure (A-2.2) Scatterplot of the Standardized Residual for Lao PDR



APPENDIX A - 3

Analysis Results for Myanmar

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.994[a]	.988	.985	1.09486	2.150

a. Predictors: (Constant), FW, PREANE, SC, LEXfe

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1308.640	4	327.160	272.926	.000[b]
	Residual	15.583	13	1.199		
	Total	1324.223	17			

a. Dependent Variable: IMR

b. Predictors: (Constant), FW, PREANE, SC, LEXfe

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	283.447	48.883		5.798	.000		
	LEX	-3.421	.816	-.822	-4.195	.001	.024	42.457
	SC	-.175	.198	-.143	-.881	.394	.034	29.012
	PREANE	-.024	.167	-.005	-.141	.890	.821	1.217
	FW	.151	.215	.047	.702	.495	.198	5.041

a. Dependent Variable: IMR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.986[a]	.972	.966	1.61851	1.845

a. Predictors: (Constant), FW, PREANE, SC

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1287.549	3	429.183	163.837	.000[b]
	Residual	36.674	14	2.620		
	Total	1324.223	17			

a. Dependent Variable: IMR

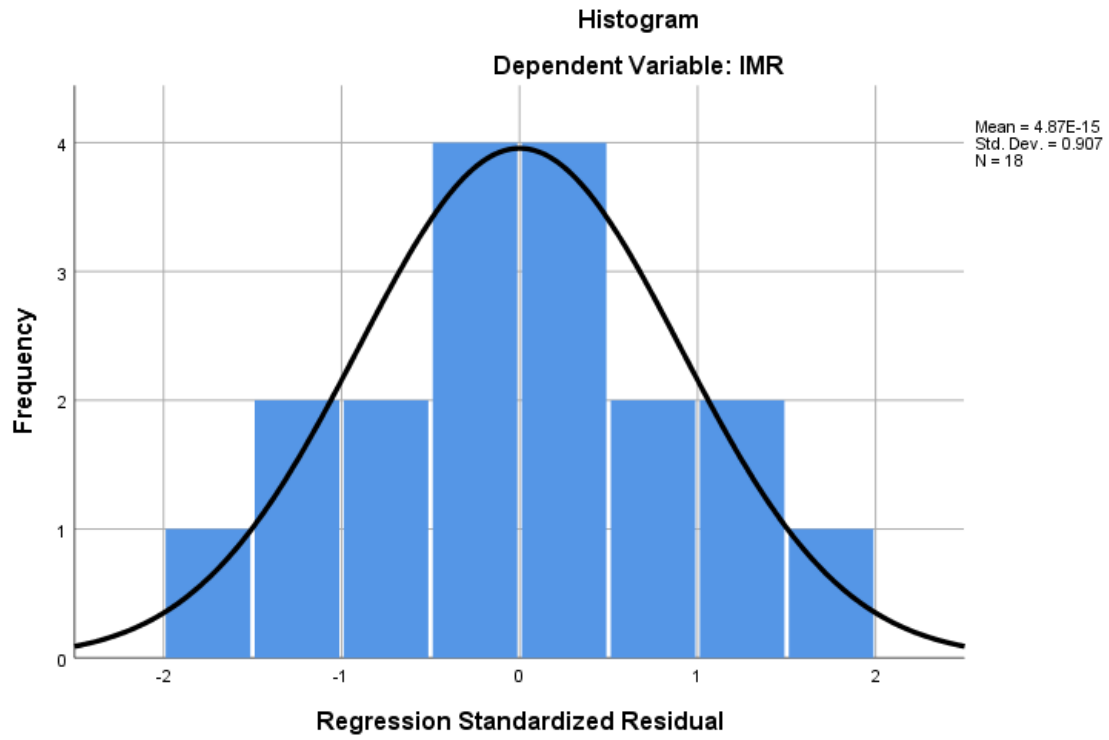
b. Predictors: (Constant), FW, PREANE, SC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	80.308	9.829		8.170	.000		
	SC	-.982	.068	-.804	-14.423	.000	.637	1.571
	PREANE	-.155	.243	-.031	-.639	.533	.851	1.175
	FW	.892	.182	.280	4.896	.000	.606	1.651

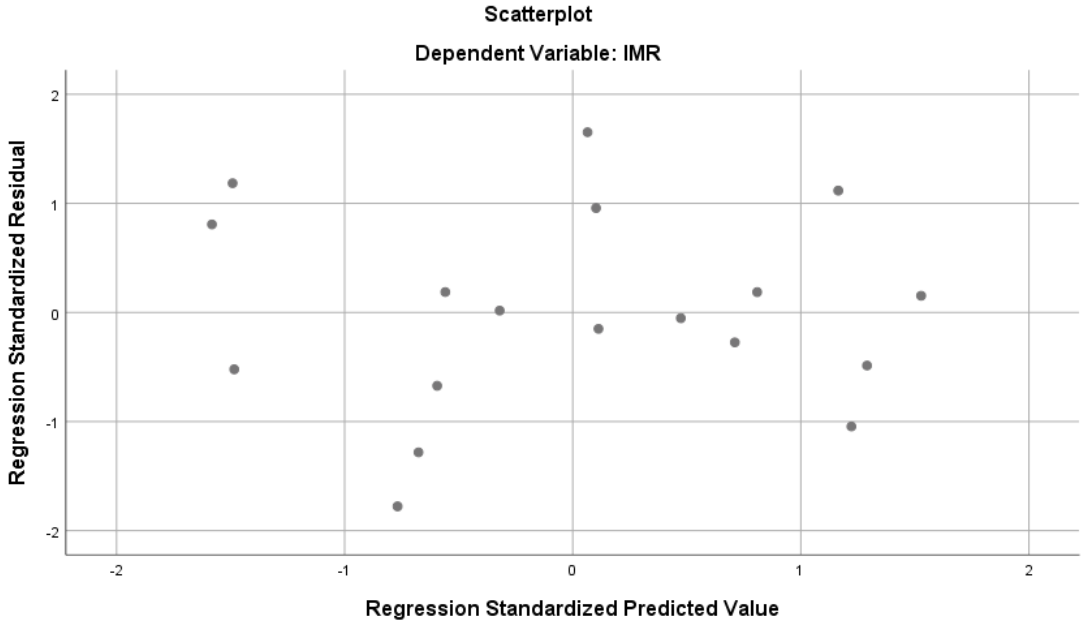
a. Dependent Variable: IMR

Figure (A-3.1) Histogram of the Standardized Residual for Myanmar



Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	0.141	18	0.200*	0.981	18	0.962

Figure (A-3.2) Scatterplot of the Standardized Residual for Myanmar



APPENDIX A – 4

Analysis Results for Vietnam

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.998[a]	.997	.995	.14742	1.447

a. Predictors: (Constant), LEXfe, PREANE, SC, FW

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.317	4	20.329	935.412	.000[b]
	Residual	.283	13	.022		
	Total	81.600	17			

a. Dependent Variable: IMR

b. Predictors: (Constant), LEXfe, PREANE, SC, FW

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	319.753	30.988		10.318	.000		
	SC	-.006	.012	-.027	-.497	.628	.089	11.280
	PREANE	.189	.042	.216	4.493	.001	.115	8.660
	FW	-.027	.009	-.166	-2.941	.011	.084	11.911
	LEX	-3.856	.393	-.950	-9.807	.000	.028	35.269

a. Dependent Variable: IMR

Table (A4) Analysis Results for Vietnam (Continue)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.985[a]	.969	.965	.40827	1.922

a. Predictors: (Constant), PREANE, SC

b. Dependent Variable: IMR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79.100	2	39.550	237.277	.000[b]
	Residual	2.500	15	.167		
	Total	81.600	17			

a. Dependent Variable: IMR

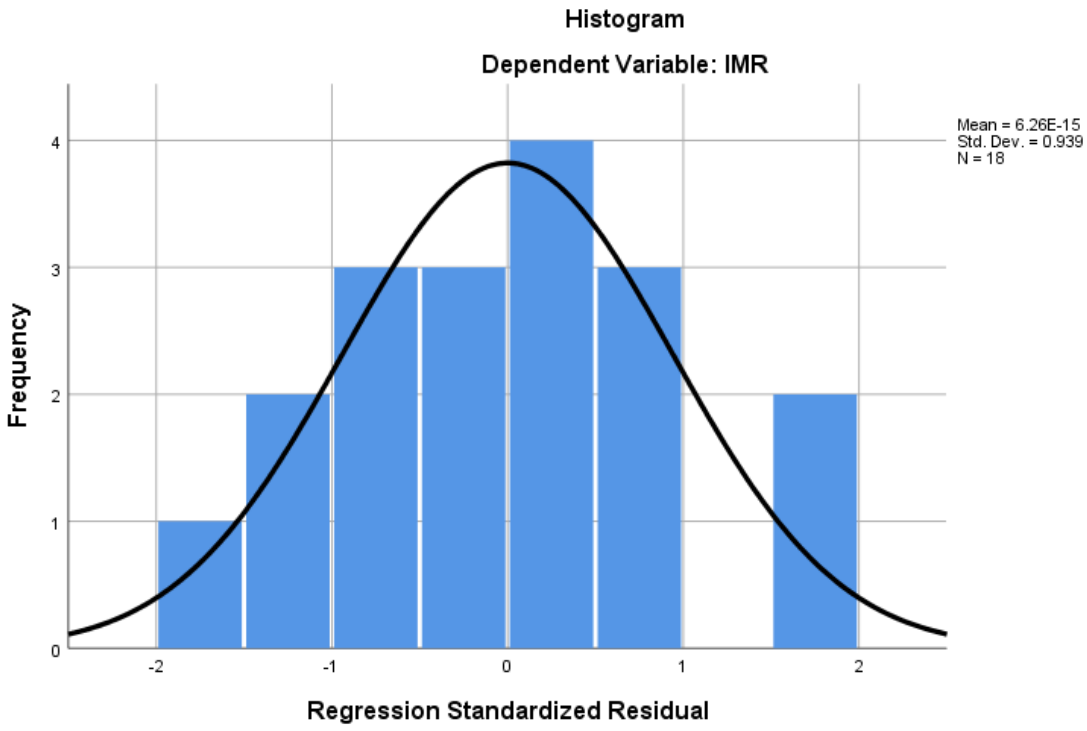
b. Predictors: (Constant), PREANE, SC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	16.103	1.646		9.783	.000		
	SC	-.116	.011	-.534	-10.422	.000	.777	1.286
	PREANE	.536	.045	.612	11.947	.000	.777	1.286

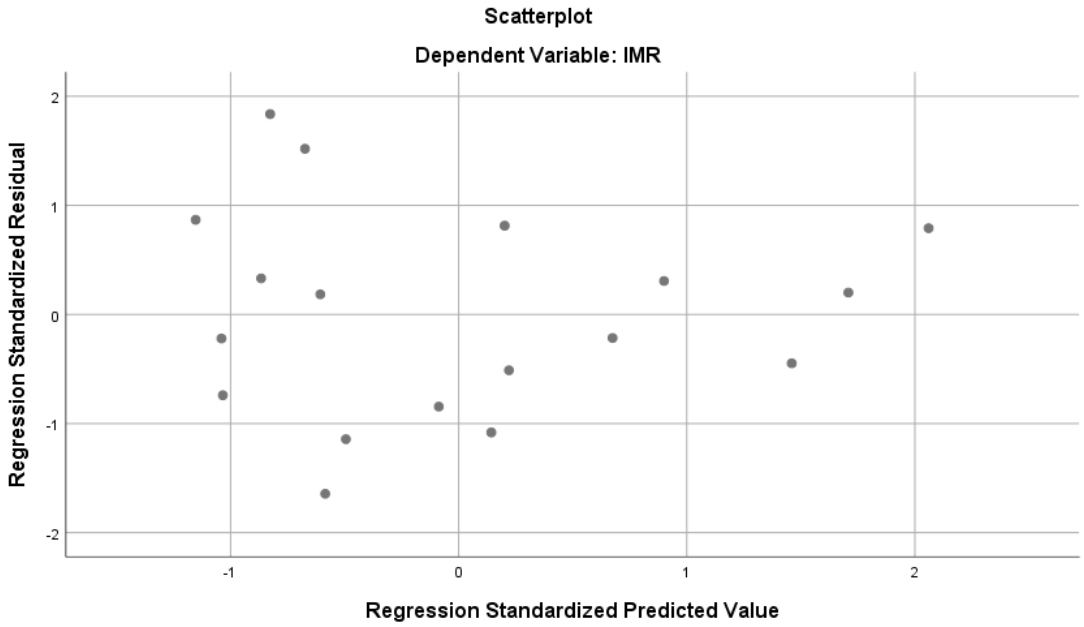
a. Dependent Variable: IMR

Figure (A-4.1) Histogram of the Standardized Residual for Vietnam



Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual	0.091	18	0.200*	0.981	18	0.956

Figure (A-4.2) Histogram of the Standardized Residual for Vietnam



APPENDIX A - 5

Estimation Results

IMR = -79.408 – 0.547 SC + 3.076 PRE_ANE (Camboida)

Year	IMR	SC	PRE_ANE	Estimated IMR
1999	83.50	32.00	55.28	73.13
2000	79.50	35.60	58.36	80.63
2001	73.80	30.00	55.20	73.98
2002	67.60	37.80	53.60	64.79
2003	62.00	31.58	52.17	63.79
2004	57.30	35.00	51.10	58.63
2005	53.20	45.00	52.32	56.91
2006	49.80	31.92	49.60	55.70
2007	46.60	35.99	48.10	48.86
2008	43.50	42.04	47.30	43.09
2009	40.50	44.40	48.00	43.95
2010	37.70	47.90	46.20	36.50
2011	35.00	45.43	44.60	32.93
2012	32.60	44.09	45.20	35.51
2013	30.50	43.56	46.10	38.57
2014	28.90	45.64	41.80	24.20
2015	27.50	48.98	42.30	23.91
2016	26.20	48.65	44.80	31.79

IMR = -48.610 – 0.700 SC + 2.200 PRE_ANE + 1.226 FW (Lao PDR)

Year	IMR	FW	PRE_ANE	SC	Estimated IMR
1999	78.9	40.48	44.2	27.32	79.1
2000	76.2	41.01	43.0	29.58	75.6
2001	73.6	41.55	41.9	31.02	72.8
2002	71.0	41.99	43.0	34.59	73.3
2003	68.4	42.45	40.1	36.69	66.0
2004	65.9	42.78	39.3	39.37	62.7
2005	63.3	43.22	38.5	39.26	61.6
2006	60.8	42.78	37.7	38.04	60.2
2007	58.4	42.14	34.0	38.31	51.0
2008	56.1	42.46	36.5	40.02	55.7
2009	53.8	42.77	36.1	42.51	53.5
2010	51.7	43.15	36.0	37.74	57.1
2011	49.5	42.46	36.1	39.90	54.9
2012	47.5	40.89	36.5	43.22	51.6
2013	45.6	39.23	37.1	46.76	48.4
2014	43.7	38.36	36.5	52.99	41.6
2015	42.0	38.02	38.7	59.72	41.3
2016	40.4	37.89	39.7	64.11	40.3

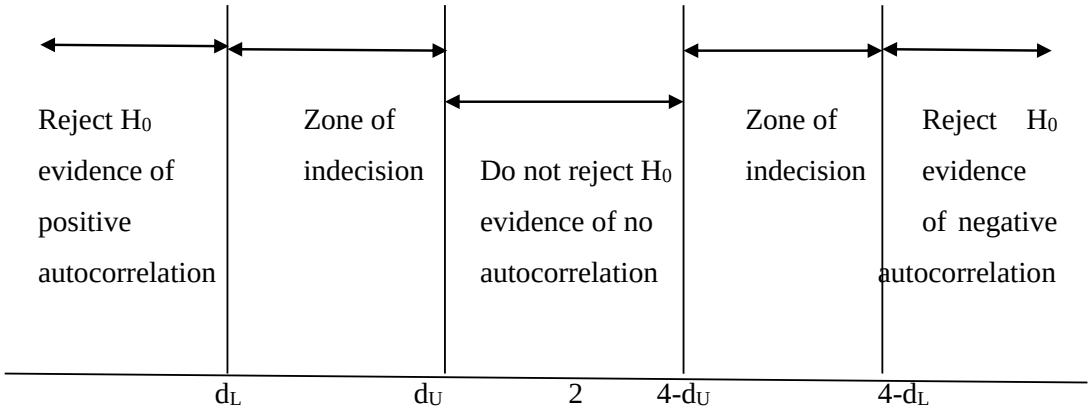
IMR = 80.308 + 0.892FW – 0.982 SC – 0.155 PRE_ANE (Myanmar)

Year	IMR	FW	SC	PRE_ANE	Estimated IMR
1999	66.6	25.26	29.99	45.2	66.38
2000	65.0	25.24	33.32	44.4	63.22
2001	63.5	25.14	32.24	43.6	64.31
2002	62.0	24.96	32.78	43.0	63.72
2003	60.4	24.68	36.28	42.4	60.12
2004	58.8	24.34	36.92	41.9	59.27
2005	57.1	23.87	38.57	42.0	57.22
2006	55.5	23.32	41.52	41.0	53.99
2007	53.8	22.70	40.91	40.7	54.08
2008	56.3	22.18	40.91	40.4	53.66
2009	50.3	21.45	43.68	40.3	50.30
2010	48.5	20.73	44.87	42.0	48.23
2011	46.8	20.21	44.87	41.0	47.92
2012	45.1	19.53	44.87	41.7	47.21
2013	43.5	18.80	44.87	42.6	46.41
2014	42.0	18.12	50.51	43.6	40.12
2015	40.6	17.47	50.51	44.9	39.33
2016	39.3	26.35	57.49	46.3	40.18

IMR = 16.103 – 0.116 SC+ 0.536 PRE_ANE (Vietnam)

Year	IMR	SC	PRE_ANE	Estimated IMR
1999	24.50	65.16	29.10	24.14
2000	23.50	66.16	27.90	23.38
2001	22.70	65.22	26.70	22.85
2002	21.80	71.50	25.80	21.64
2003	21.10	72.00	25.00	21.15
2004	20.50	71.55	23.00	20.13
2005	20.00	73.05	23.40	20.17
2006	19.60	71.25	22.70	20.01
2007	19.20	72.30	22.00	19.51
2008	18.90	80.00	21.30	18.24
2009	18.70	81.00	20.90	17.91
2010	18.50	75.50	20.60	18.39
2011	18.20	79.90	22.00	18.63
2012	18.00	82.20	21.00	17.82
2013	17.80	79.27	21.50	18.43
2014	17.60	93.13	22.20	17.20
2015	17.40	95.19	23.10	17.44
2016	17.20	100.00	24.20	17.47

Figure (A5): Durbin-Watson Statistic



1.046	1.535	2.465	2.954	(k=2)
0.933	1.696	2.304	3.067	(k=3)

Table (A6) – Variable Metadata

Variable Name	Source Note	Source Organization
Mortality rate, infant (per 1,000 live births)	Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.	Estimates developed by the UN Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA Population Division) at www.childmortality.org.
Life expectancy at birth, female (years)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	(1) United Nations Population Division. World Population Prospects: 2017 Revision or derived from male and female life expectancy at birth from sources such as: (2) Census reports and other statistical publications from national statistical offices, (3) Eurostat: Demographic Statistics, (4) United Nations Statistical Division. Population and Vital Statistics Reprot (various years), (5) U.S. Census Bureau: International Database, and (6) Secretariat of the Pacific Community: Statistics and Demography Programme.
Lower secondary completion rate, Female (% of relevant age group)	Lower secondary education completion rate is measured as the gross intake ratio to the last grade of lower secondary education (general and pre-vocational). It is calculated as the number of new entrants in the last grade of lower secondary education, regardless of age, divided by the population at the entrance age for the last grade of lower secondary education.	UNESCO Institute for Statistics
Contributing family workers, female (% of female employment)	Contributing family workers are those workers who hold "self-employment jobs" as own-account workers in a market-oriented establishment operated by a related person living in the same household.	International Labour Organization, ILOSTAT database. Data retrieved in September 2018.
Prevalence of anemia among pregnant women (%)	Prevalence of anemia, pregnant women, is the percentage of pregnant women whose hemoglobin level is less than 110 grams per liter at sea level.	World Health Organization, Global Health Observatory Data Repository/World Health Statistics (http://aps.who.int/gho/data/node.main.1?lang=en).